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Proceedings

of the Marine Safety Council

Vol. 43, No. 1

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Cover

The Coast Guard is becoming increasingly concerned about the shipment of hazardous materials and is conducting a random, "spotcheck" program to determine the problem's scope. LCDR John P. Aherne, author of the article beginning on page 3, took this photo of unsafe packaging while participating in an inspection.

Hazardous Materials in Freight Containers :

The Coast Guard Is Looking

LCDR John P. Aherne
Hazardous Materials Branch
Marine Technical and Hazardous Materials Division
U.S. Coast Guard

In the port of Houston, a freight container explosion from improperly packaged aluminum phosphide on board the M/V RIO NEUQUEN killed one dock worker. When inspectors from the Mobile, Alabama, Marine Safety Office opened a freight container, boxes of high explosives came tumbling out and crashed open on the deck. In the same freight container, they found detonators marked, "Do not store with high explosives." New York's Captain of the Port found nine drums of an oxidizer in a freight container without the required hazardous material warning placards. The shipping papers indicated that there were no dangerous goods in the container. They also found a freight container shipment of explosives being imported from the United Kingdom in total disarray with no blocking, bracing, or securing within the container. Many of the packagings were badly damaged.

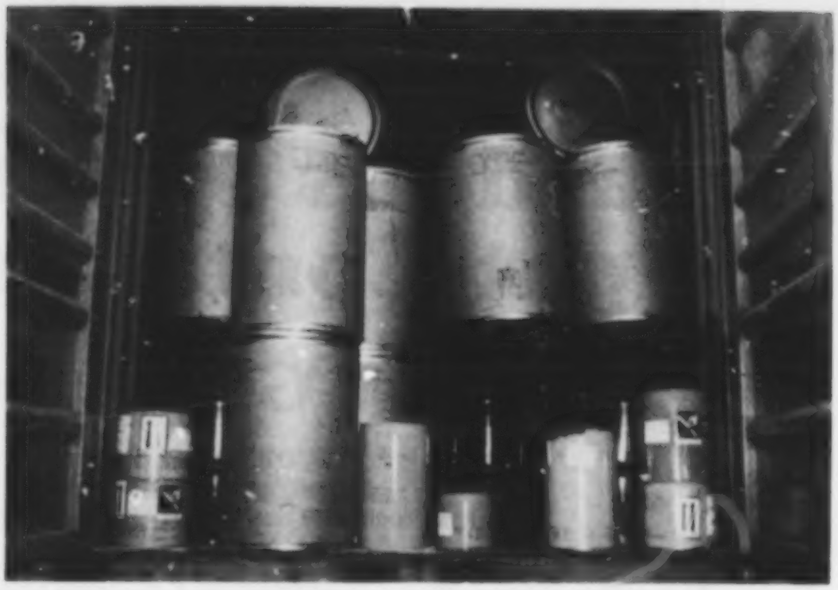
Inspectors required this load to be repacked and secured before leaving the marine terminal. Photo by John P. Aherne.

One one of these instances resulted in a casualty. All, however, had the ingredients of a major incident. The Coast Guard is becoming increasingly concerned about the shipment of hazardous materials and is conducting a program to determine how big the problem is.

Twenty- and forty-foot freight containers have become one of the primary means of shipping cargo in the United States. Weekly, thousands of freight containers filled with hazardous materials are imported and exported through U.S. marine terminals. Freight containers are rarely opened until they reach their final destination, and, therefore, little control is exercised over how hazardous materials are shipped.

As part of this effort to determine the extent of the problems with containerized hazardous materials, Coast Guard Captains of the Port and Marine Safety Offices are conducting random spotchecks inside freight containers as they pass through U.S. marine terminals. The Coast Guard spotcheck of the containers is being coordinated with other U.S. Department of Transportation (DOT) modal agencies, the National Cargo Bureau, Inc., and the U.S. Customs Service. In some ports, the U.S. Customs inspectors may open up to 40 percent of all imported freight containers. Customs officials can notify the Coast Guard when serious problems are found.

The DOT Office of Hazardous Materials Transportation is also helping in this effort. They have begun inspections of the freight consolidator facilities outside the port area, in New York and elsewhere, where the Coast Guard does not have regulatory authority. This is where many of the freight containers are packed.



Unsecured drums may roll and break open during shipment. Photo by John P. Aherne.

The Coast Guard is looking for problems such as incompatible or improperly secured packages in the container, undeclared hazardous materials, and missing placards. Rear Admiral (Lower Half) J.W. Kime, Chief of the Coast Guard's Office of Merchant Marine Safety, said, "Previously in most ports the Coast Guard responded only if there was a hazardous materials incident. Now we are trying a more preventative approach — find the problem before it becomes a casualty."

Insufficient blocking and bracing of goods within a container may be the greatest safety problem with hazardous material shipments. Packages approved to carry a particular hazardous material are not meant to withstand the punishment that can occur during transportation when improperly secured in a freight container.

A primary concern is freight containers packed outside the port area by freight consolidators. They receive cargo from various shippers and pack the cargo into freight containers with similar destinations. Indications are that many consolidators are not totally familiar with the DOT Hazardous Materials Regulations.

Industry sources — in particular, vessel operators — have told of the economic pressures that go along with accepting cargo. These are difficult times for the maritime industry, and there is strong competition among the shipping lines. Each container moved means business for the vessel operator. As a result, some carriers may be reluctant to ask too many safety-related questions for fear that the shipper may take his cargo someplace else.

Ron Bohn, Hazardous Materials Coordinator for the National Cargo Bureau, agrees, "The carrier that makes the person offering the hazardous material aware of a restriction should know that he is taking a chance." He cites a case in which a freight forwarder offered a nitrate product in the same container with a flammable liquid. The carrier pointed out that this was strictly prohibited. The forwarder then contacted another line, which accepted his cargo.

Both the DOT regulations found in Title 49 of the Code of Federal Regulations and the International Maritime Dangerous Goods (IMDG) Code require packages of hazardous materials be tightly packed within the freight container or adequately braced and secured to prevent cargo movement during the voyage. This requirement is a performance-oriented requirement and must be used with sound judgment on the part of the freight container packer. The load must be able to withstand the rigors of the transportation system.

Indications are that approximately 20 percent of the containers inspected by the Coast Guard in this program have been found in violation of the regulations. Some ports are worse than others. The Miami Marine Safety Office found a number of serious problems, including import freight containers holding 100-pound cylinders of anhydrous ammonia, a poisonous gas, rolling around loose without any means of securing within the container. Another container was found packed with 55-gallon drums of toluene diisocyanate, a poison, stacked on top of each other with no dunnage in between.

The San Francisco Marine Safety Office has determined that most of the problems they found could be traced to certain shippers. They are working directly with these shippers to ensure that the regulations are followed.

The New York Captain of the Port has an active freight container inspection program. Although they are finding their share of discrepancies, generally most shippers appear to be complying with at least the minimum standards of blocking and bracing within the container. There may be other problems. LTJG Bart Polizzotti, Hazardous Materials Officer, said, "I am concerned with those freight container consolidators who try to avoid Coast Guard inspections by documenting hazardous materials in freight containers as general cargo or freight-all-kinds. This may be a real problem."

Since the Coast Guard began this hazardous materials inspection effort, there are indications that shippers are trying to become more aware of the regulations and are making a greater effort to comply. One hazardous materials supervisor for a major U.S. vessel operator said that the number of inquiries from freight consolidators on "how to do it right" has increased dramatically. A National Cargo Bureau inspector noticed that fewer freight containers are missing the hazardous materials warning placards.

Coast Guard units are making efforts not to disrupt the ongoing vessel and terminal activities. The Coast Guard is going after the persons who are responsible for the violations. In many cases, this is the freight consolidator and shippers who packed the container and not the terminal and vessel operators. Shippers should know that the Coast Guard is now looking at shipments of hazardous materials, and violations will be issued to those responsible. Violators can be fined up to $10,000 for each violation. The Hazardous Materials Transportation Act also provides for criminal penalties up to $25,000 and/or 5 years' imprisonment. ‡

Letters to the Editor

October 3, 1985
Bangkok, Thailand

To the Editor:

I refer to the article "Blind Spots in Front of Tows" by LCDR Chris Walter and LT Roy Nash, appearing in your October 1985 issue.

The accident described there is certainly most regretful. The need of TV cameras or human lookouts on such extra-high barges is however of common sense, and is practiced by all sensible waterways operators. It is a tradition since centuries past, when deck barges loaded with cotton or other bulky cargoes were the most common sight on U.S. rivers; even in this century, deck barges of the Federal Barge Lines had deckhouses running on most of their length, and this feature perdures today in Asia, in China, and above all in India. Barges carrying cars in Europe have also quite high superstructures aft, and navigate in very restricted waterways. Cargoes of pipes piled up high above deck level in hopper barges are still common in the U.S., and extra-high barges are the rule today on the Columbia.

Besides, whatever its height loaded, a barge is always a bit high on the water by the bow when it is empty, and every trained skipper knows it; a special device, similar in principle to a periscope, is even used on self-propelled barges in western Europe to cope with it, and although the contraption is a

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An Update from the Port of New York

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MAYDAY! We're Taking on Water, We're Going Down

LT Albert W. Horsmon, Jr.
Marine Technical and Hazardous Materials Division
U.S. Coast Guard

On October 27, 1983, the tug EAGLE was towing two barges in the Gulf of Alaska 25 miles west-southwest of Cape Fairweather. At about 1530 Pacific Daylight Time, in a full gale, the tug heeled sharply to starboard and began flooding. It sank within a few minutes, the towing hawser still attached. Only one person from the crew of nine survived. Often, the exact cause of casualties like this cannot be positively determined. However, the lone survivor was able to recall the liquid loading at the time of the sinking. With this information and knowledge of the wind and sea conditions, we can attempt to reconstruct what may have happened to the tug EAGLE.

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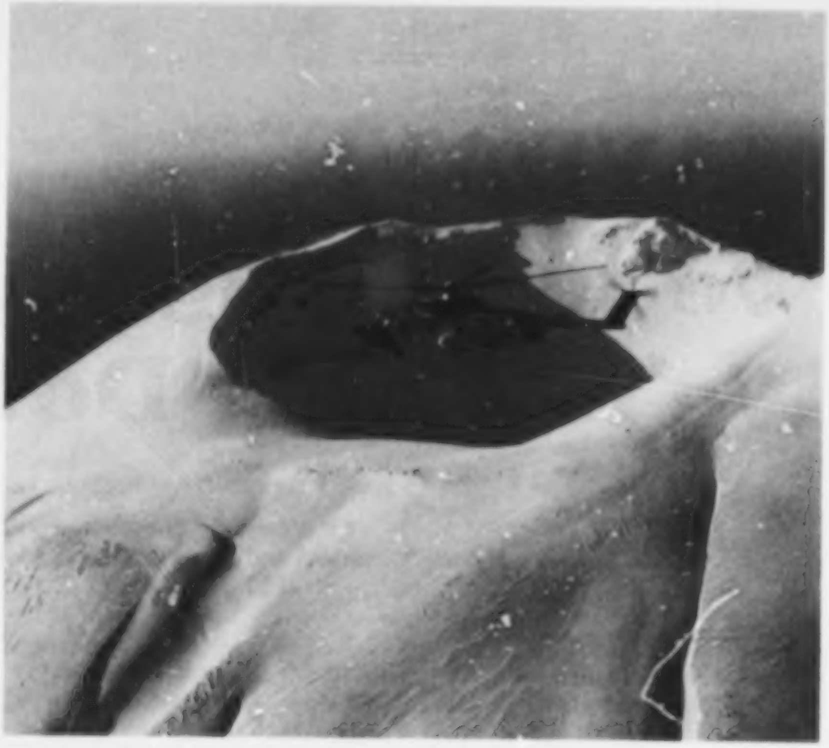
The Casualty

The last voyage of the tug EAGLE was to have been from Anchorage to Seattle. The EAGLE, with two lightly loaded barges in tow astern, encountered rough weather the first day out and hid in Prince William Sound until the weather cleared. The National Weather Service issued an improved forecast for 25 October, so the EAGLE and her barges sailed into the Gulf of Alaska headed for Seattle.

Early in the morning of 27 October, the weather started to deteriorate and got worse throughout the day. By mid-afternoon, the seas had grown to 25 to 30 feet with occasional 50-foot waves, and the wind was gusting to 65 knots. The weather was so bad that the EAGLE and another tug in the vicinity with a similar tow were losing ground to the storm.

At about 1530, the EAGLE rolled about 45° to starboard, hung there momentarily, then continued over to 80° and began to downflood through the engine room vents and other topside openings. "Mayday, we're taking on water, we're going down" were the last words heard from the vessel. The tug sank in about 10 minutes, taking with it five of the nine crew members. Of the four who got out, only one had his exposure suit to protect him from the chilling water. He was the only one who the crew of Coast Guard H-3F 1470 from Sitka was able to find and rescue.

At first glance it might appear that this was purely a weather-related casualty. The wind-driven barges were pulling the EAGLE astern faster than the tug was pulling them forward. In this situation the tug was overcome by a wave and rolled over. A likely conclusion. However, a closer look at the stability criteria for tugs and the liquid loading of the tug EAGLE bring to light some other possible causes.



This Coast Guard H-3 helicopter from Sitka, Alaska, searched for the EAGLE's crew. Only one crew member had donned an exposure suit. He was the sole survivor. (Official Coast Guard photo)

The Stability Criteria

The tug EAGLE was built in 1973 and was required to obtain a load line. The Coast Guard regulations for load lines include providing stability information to the masters of load lined vessels. As part of the procedure for providing this information, the Coast Guard has developed stability regulations for the various classes of vessels. Generally, the requirements applied to towing vessels in 1973 were that

- the area under the vessel's righting arm curve meet or exceed a specified value;

- the vessel meet a towline pull criteria which establishes a minimum required metacentric height (GM). This was intended to prevent the vessel from pulling itself over (self-tripping) as a result of the overturning moment created by the towline and the propeller forces.

- the vessel meet a weather criterion by having a metacentric height equal or greater than that required based on weather taking a given wind force acting on the hull above the waterline and the deckhouse.

At that time, the only loading condition evaluated was that which produced the full load line draft. The assumption was that for a tug to be effective in towing, it had to keep its screw deep in the water, i.e., maintain its full draft.

As a result of casualties and advancements in design during the last decade, the Coast Guard has revised the stability requirements for towing vessels to include an optional dynamic towline pull criteria, twice as much GM for the static towline pull criteria, and a specified minimum angle of downflooding. Additionally, tugs must meet these requirements at all operating drafts which is usually covered by evaluating the full load, intermediate (part ballast), and burned out (10 percent consummables) loading conditions. Novel design features that may adversely affect stability, such as special propulsion systems, rudders, or raisable pilot houses, are separately evaluated.

The Stability Analysis

To support his investigation, the investigating officer from Marine Safety Office Juneau requested the Twelfth Coast Guard District technical office to analyze the vessel's stability at the time of the casualty. The chief engineer (unlicensed) and sole survivor of the tug EAGLE recalled the liquid loading of the tug when it sank and related it to the investigator. This loading condition came from taking fuel suction from and adding ballast to various tanks to maintain draft and trim on the long voyage from Seattle to Anchorage and part way back. The information was used to reproduce the casualty loading condition, which is shown in part in figure 1.

Figure 1

CASUALTY LOADING CONDITION

TANK	% FULL	VCG at 100%	FREE SURFACE CORRECTION
1. FORE PEAK BALLAST	100.0	11.2	0
2. PORT & STBD BALLAST	0	13.3	0
3. NO. 1 P/S FUEL	45.0	9.6	.12
4. FUEL OIL DAY TANK	81.2	13.2	.03
5. NO. 2 P/S FUEL	0	4.0	0
6. NO. 2 CENTER FUEL	0	3.7	0
7. P/S WING BALLAST	100.0	11.2	0
8. NO. 3 P/S FUEL	84.3	13.3	.11
9. NO. 3 C FUEL	93.2	13.2	.04
10. AFT P/S BALLAST	15.1	14.9	.17
	FREE SURFACE - FUEL & BALLAST		.46
	FREE SURFACE OTHER TANKS		.03
	TOTAL FREE SURFACE EFFECT		.49

Figure 2

REARRANGED FUEL LOAD

TANK	% FULL	VCG at 100%	FREE SURFACE CORRECTION
3. NO. 1 P/S FUEL	0	9.6	0
4. FUEL OIL DAY TANK	93.0	13.2	.03
5. NO. 2 P/S FUEL	100.0	4.0	0
6. NO. 2 CENTER FUEL	100.0	3.7	0
8. NO. 3 P/S FUEL	0	13.3	0
	FREE SURFACE - FUEL TANKS		.03
	OTHER FREE SURFACE (includes ballast)		.23
	TOTAL FREE SURFACE EFFECT		.26

The vertical center of gravity (VCG) in this condition was estimated as being 15.13 feet above the baseline when corrected for the free surface of the slack tanks. GM was estimated at 2.63 feet, and the available righting energy (the total area under the righting arm curve) was 13.19 foot-degrees to the 42° range of positive righting arm.

To determine the effect that the liquid loading had on the casualty, an additional analysis was done by rearranging the fuel load from the slack No. 1 P/S and No. 3 P/S fuel tanks to the lower No. 2 fuel tanks while maintaining the same total fuel load. The tanks involved are listed in figure 2.

The result was to lower the actual center of gravity by 0.67 feet with a further 0.23-foot reduction in the free surface correction gained by eliminating the free surface in the fuel tanks. The VCG of each tank at 100 percent capacity is listed to show the relative vertical location of each tank. A 0.90-foot effective reduction in the height of the center of gravity to 14.23 feet above the baseline is significant in that the metacentric height (GM) is increased by 0.90 feet. GM grows from about 2.63 feet in the estimated casualty loading condition to 3.53 feet in the condition with the fuel load redistributed. Even more signifcant is the increase in the available righting energy to 37.06 foot-degrees, nearly a 300 percent increase with the fuel load rearranged.

The Casualty Analysis

A stability criteria attempts to set a safety standard which should ensure a minimum amount of safety. However, it remains the operator's responsibility to maintain the vessel in the minimum safe loading condition. Stability is not something one can point to and say that (referring to this casualty) 3.53 feet of GM is safe, and 2.63 feet of GM is unsafe, or that having three times as much righting energy available is excessively safe. However, one can easily see that 3.53 feet of GM is more stable than 2.63 feet of GM and that extra righting energy is desirable to help survive extreme situations.

There are other factors which may have contributed to this casualty in addition to the severity of the weather. The

National Transportation Safety Board, in its report on the casualty (NTSB/MAR-84-07), alluded to the idea that the hold-down device or fair-lead for the towing cable could have failed, allowing the towing cable to tend from the winch instead of the main deck. This would have increased the towline pull heeling moment arm (by which the towline could upset the tug) by 3.5 feet or about 25 percent. Second, a technical study done for the Coast Guard indicated that a vessel perched on a wave can have significantly reduced stability. Third, the same study showed that tow-induced tripping (the tow pulling the tug) is a more dangerous situation than tug self-induced towline pull tripping. The tug EAGLE was certainly in a position to be perched on a wave, and in the gusting winds, the barges were actually towing the tug.

Any one or a combination of the factors mentioned above may have caused or contributed to the casualty. Additionally, other factors not mentioned or known to anyone involved in investigating or analyzing this casualty may have influenced the fate of the tug EAGLE. We will never know with any degree of certainty. ⚓

LETTERS TO THE EDITOR

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bit crude, it does render efficient service.

So your article was right in attracting the attention of the readers to this issue, and will hopefully result in less casualties on this wonderful medium shared by both commerce and recreation navigation, the Waterway.

However, I would like to point out that the calculation in the article is valid only if it is a swimmer who is in the blind spot, because it fails to take into consideration the height of the other craft over the water; incidents with sailing craft are for instance much unlikely, taking the height of the mast into consideration; besides, towboats are known to be able to stop within a distance not exceeding the length of their tow, thanks to the use of the flanking rudders, which was involved in the mishap, and they are not that manoeverable. But I would caution strongly against applying "blindly" the above-mentioned method to all cases, as it would become obviously vitiated in a number of instances due to the size of the incoming boat. If the facts reported there are true, then it involves human error, and the principle of extra-high barges is not at fault.

Could there be some technical solutions to help in the navigation of such bulky barges? Besides having a lookout and/or a TV camera in front with a monitor in the wheelhouse, a remote control wheelhouse on the barge is feasible, as was shown by the carriage of the Saturn rockets down the Tennessee and the Mississippi Rivers in the past decades. The Coast Guard is well aware of this technical success, as these barges were constantly monitored by one of its cutters. A special short range radar fitted in front of the barge with all the anti-clutter devices available could also help in a big way. Finally, collapsible wheelhouses could actually be raised higher than usual when a closer watch has to be maintained. But in channels jampacked with small boats not paying any attention to the incoming traffic (the accident described is a case in point), it is not enough to be informed: One must be also able to take action if for instance its sound signals fail to bring the adequate response from the incoming boat.

Apart from the use of flanking rudders, which render a stop faster by enabling a tow to keep on course even in extreme deceleration conditions, fixed-angle bow rudders have proved effective when they are both lowered at the same time, acting as a kind of "water-brake" much akin to the "aero-brakes" used by commercial airliners. In normal service they are used only one at a time, the depth of immersion of their surface giving the same control as the angle of rotation of a normal rudder; besides, they do not protrude out of the hull when not in use. thus being less prone to damage and producing no drag. A similar, more sophisticated service is given by some bow-thrusters, if their action can be directed aft while keeping the vessel in line.

All or a combination of these passive and active safety features are the key to a safer Waterway, particularly when tows have only one or two barges; they appear to be a must when extra-high barges are considered.

Sincerely yours,
J.M. Deplaix

Authors LT Roy Nash and LCDR Christopher Walter reply:

We have read Mr. Deplaix's letter with

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Update: Navigation and Vessel Inspection Circulars

To date, the Coast Guard has published the following Navigation and Vessel Inspection Circulars (NVICs) in 1985:

NVIC No.	Title of NVIC	Price
10-81, CH-1	Change 1 to NVIC 10-81, "Coast Guard Certification and Inspection of Certain Categories of Existing Vessels"	$1.75
10-82, CH-1	Change 1 to NVIC 10-82, "Acceptance of Plan Review and Inspection Tasks Performed by the American Bureau of Shipping for New Construction of Major Modifications of U.S. Flag Vessels"	1.75
0-85	Index of Navigation and Vessel Inspection Circulars (NVICs)	NC
1-85	Fire Safety Standards for Foreign Passenger Vessels	1.75
2-85	Notification to the U.S. Coast Guard for Enforcement of Load Line Requirements	1.75
3-85	Bulk Liquid Cargo Finding Aid	1.75
4-85	Recalls and Other Corrective Measures for Lifesaving Equipment	1.75
5-85	Proposed Voluntary Stability Standards for Uninspected Commercial Fishing Vessels	1.75
6-85	Radio and Shipboard Navigation Equipment; Proposed Voluntary Standards for Uninspected Commercial Fishing Vessels	1.75
7-85	Fire Safety Measures; Proposed Voluntary Standards for Uninspected Commercial Fishing Vessels	1.75
8-85	Lifesaving Equipment and Protection of the Crew; Proposed Voluntary Standards for Uninspected Commercial Fishing Vessels	1.75
9-85	Hull, Machinery and Electrical Installations; Proposed Voluntary Standards for Uninspected Commercial Fishing Vessels	1.75
10-85	Oversight of Technical and Administrative Aspects of Load Line Assignment	1.75
11-85	Coast Guard Guidance Regarding Requirements for Automatic Radar Plotting Aid (ARPA) and Device to Indicate Speed and Distance (Speed Log)	1.75

NVICs published in 1986 may be purchased separately or by subscription from the following address:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

For additional assistance or information please call (202) 426-0173.

Requests for back issues of NVICs (1985 and earlier) may be directed to the address listed below. NVIC No. 0-86, an Index of Navigation and Vessel Inspection Circulars in effect as of January 1, 1986, can be obtained free of charge by calling (202) 426-0173 or by writing to:

Commandant (G-MP-2)
U.S. Coast Guard
Washington, D.C. 20593
ATTN: NVICs

LETTERS TO THE EDITOR

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*interest and appreciate his comments on our article "Blind Spots in Front of Tows" (**Proceedings**, October 1985). We also found Mr. Deplaix's discussion of towing vessel use in other parts of the world and towing vessel maneuvering very interesting.*

Mr. Deplaix's point that our calculation is only valid for objects right at the surface of the water is certainly correct, and we qualified our calculation to account for this very fact. Even with the size of the object taken into acount, we maintain that a properly stationed lookout can provide the operator with vital information until the tow safely passes any given object. In this case, if a sailboat with a mast 22 feet above the water were ahead of the tow, it would have been completely obscured by the barge when it was about 720 feet in front of the barge (over 1,000 feet from the operator's eye). Our concern dealt with the lack of a proper lookout, rather than the size of the barge being pushed or the maneuvering characteristics of towing vessels and tows.

The article was written for several reasons. First, both licensed operators on this tug grossly underestimated the length of the blind spot by a factor of six. Second, tugboat operators can learn valuable lessons from this casualty, such as how to calculate a blind spot. Third, we wanted to point out that the Administrative Law Judge considered the failure to post a proper lookout in this case to be gross negligence.

We do not feel that technical solutions can replace the experience and prudent judgment of the mariner nor the eyes of a trained lookout who is posted to a position where he can clearly see hazards in the tow's path. Some technological approaches may have application as enhancements to the sight, hearing, and judgment of the mariner. However, we do not believe that safety at sea can be served by reliance upon such devices in lieu of a lookout. In the case of a towing vessel pushing a large barge in a crowded waterway, it is simply asking too much fo the operator to monitor short-range radar, video cameras, sound pickups (Rule 5 of both the Inland and International Navigation Rules require the maintenance of a proper lookout by both sight and hearing) and the like while trying to maintain control of a large, unwieldy barge. Technological approaches also have not solved problems that accompany wide ranges of environmental conditions such as glare, fog, reduced lighting intensity (night), and depth perception that the human eye/mind/experience combination handles with ease on a routine basis. The human mechanism is still the most widely adaptable and useful form of lookouts on vessels.

CDR R.B. Meyer, Chief, Ship Design Branch, offers further comments:

Mr. Deplaix has raised some good issues in his discussion of navigation visibility. This topic has received much international attention in the last few years and is the subject of a current U.S. regulatory project. The Coast Guard was instrumental in the preparation of an international standard for bridge visibility, which resulted in the International Maritime Organization's (IMO) passing of Draft Guidelines on Navigation Bridge Visibility in May

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Marine Safety Manual, Vol. II, Now Available

The **Marine Safety Manual** (MSM) is a 10-volume publication which provides information and guidance to Coast Guard personnel assigned to marine safety duties. First published in 1978, the MSM is being revised to update the subject matter and to comply with the Coast Guard Directives System. Volume IV, "Technical," became the first MSM volume to be published on 26 December 1984.

Seven of the volumes will be available to the general public when revision has been finalized (two volumes are being developed and one is classified):

Volume No.	Title	COMDTINST No.
I	Administration and Management	M16000.6
II	Materiel Inspection	M16000.7
III	Marine Industry Personnel	M16000.8
IV	Technical	M16000.9
V	Investigations	M16000.10
VI	Ports and Waterways Activities	M16000.11
VII	General (MOUs, Acronyms)	M16000.15

The second of the revised MSM volumes, Volume II, "Materiel Inspection," is now available from the U.S. Government Printing Office (GPO). For your convenience, we are including a GPO order form in this publication.

Volume II presents the authority, background, and rationale for the various activities performed by the Merchant Vessel Inspection Division (G-MVI) at Headquarters, and certain branches of the Marine Technical and Hazardous Materials Division (G-MTH) and the Port and Environmental Safety Division (G-WPE). Along with field marine safety units, these activities comprise the federal program for accomplishing vessel, facility, and equipment inspections. This volume describes essential functions which must be performed to attain the overall marine safety objectives of the Coast Guard.

Similar notifications will be provided in the **Proceedings** when the remaining MSM volumes are published.

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GPO 886-010

Vessel Exemptions Termination Notice for Inland and International Navigation Rules

*This notice was originally published in the September 1985 issue of **Proceedings**. Because the Coast Guard has received numerous calls on this material, we are publishing a revised notice in this **Proceedings** to emphasize the information.*

Several of the exemptions authorized in Rule 38 of the Inland and International Navigation Rules are due to expire during the next year. These exemptions were created to facilitate the transition from the requirements of the old International, Inland, Western Rivers, and Great Lakes Rules to those of the new Inland and International Rules. Some of these exemptions have time limits of 4 or 9 years after the effective date of the rules; others are permanent.

The Inland Rules' 4-year exemptions are due to expire on December 24, 1985, for all inland waters excluding the Great Lakes, which will expire on March 1, 1987. These exemptions deal with the range and color specifications of navigation lights. More information can be found in Inland Rule 38 paragraph d(i) and (ii) and Annex I.

The International Rules' 9-year exemptions are due to expire on July 15, 1986. These exemptions pertain to the horizontal and vertical positioning of navigation lights. They also deal with the requirements for sound signals. These exemptions are stated in International Rule 38 paragraph d(ii), e, f, and g. The technical information for lights is found in Annex I and for sound signals in Annex III of the Navigation Rules.

The Coast Guard considers the time allowed by these exemptions sufficient to provide for the effective and efficient transition to the new requirements. The Coast Guard has no plans to grant time extensions for these exemptions beyond those stated in Inland and International Rule 38.

The Coast Guard will not grant certificates of alternative compliance to vessels that have not converted to the new requirements, when this failure to convert is based on the fact that they failed to do so within the time frames allowed in Rule 38. Such request, based solely on the failure to meet these time frames, will not meet the requirements for granting an alternative compliance.

Those who might be affected by the expiration of these exemptions are encouraged to examine Rule 38, Annex I and III of both sets of rules in COMDINST M16672.2A, Navigation Rules International and Inland. If you have any questions, contact LTJG E. Zacharias, U.S. Coast Guard Headquarters, Navigation and Information Branch, phone (202) 245-0108. ⚓

LETTERS TO THE EDITOR

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1985. Contained in these guidelines are standards for bridge design which limit blind zone length and width due to obstructions created by fixed structure and cargo. Our regulatory project will be based on the IMO guideline; a Notice of Proposed Rulemaking should be published early next year.

In developing the U.S. position for the IMO we considered Mr. Deplaix's points. One principle we adhere to is that lookouts or secondary means of visual aids for the conning officer should never be applied in lieu of proper design of the conning station. TV cameras, periscopes, and short-range radars may be useful under certain circumstances but should not substitute for a minimum-obstruction view of the water near the vessel. These secondary aids are also susceptible to damage and don't provide the depth perception inherent in the human eye.

We agree that the line of sight projection to the waterline is a conservative approach, since other craft will normally be visible inside the blind zone for some distance. However, it provides a workable basis for comparison that can be easily computed and is consistent with the approach used in the IMO Guidelines.

Tugs and barges present particular problems when trying to apply a standard for visibility. Barges can be pushed or towed behind, the tugs may change for each trip, and tug arrangement as well as barge cargo configuration can vary greatly. Maneueverabil-

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Lessons from Casualties

Pivot Pin Failure

An equipment failure report of July 1985 brings to attention the importance of close examination and lubrication of the smaller parts of a lifeboat davit. This particular report dealt with the failure of a pivot pin in a sheath-screw davit of the basic design shown in figure 1. In this design, hand-cranking the sheath screw causes the davit arm to move in or out as it pivots about the pin marked "A." According to the report, "During abandon ship drill, as the No. 1 boat was being cranked in (sheath screw), the after davit arm pivot broke off at the junction of the arm and the forward mounting bushing. The weight of the boat pulled the arm back, bending the pin and mounting bushing at the after end until the boat's keel landed on the deck edge. Boat was not damaged."

The report describes the failed pivot pin as twisted because "...both sections froze in the bushings (figure 2). After end of same pin was bent up and back. After pivot bushing housing and mounting pad were bent, as was the forward bushing housing and the lower sheath screw mounting bracket." The report gave the cause of failure as "binding of pin in bushings due to lack of lubrication and maintenance."

The out-of-the-way location of pivot pins makes it easy to overlook their maintenance. Lubrication via the "existing grease fittings" shown in figure 2 may be impossible if they are missing or have become clogged under several layers of paint. Lubrication is necessary to permit a

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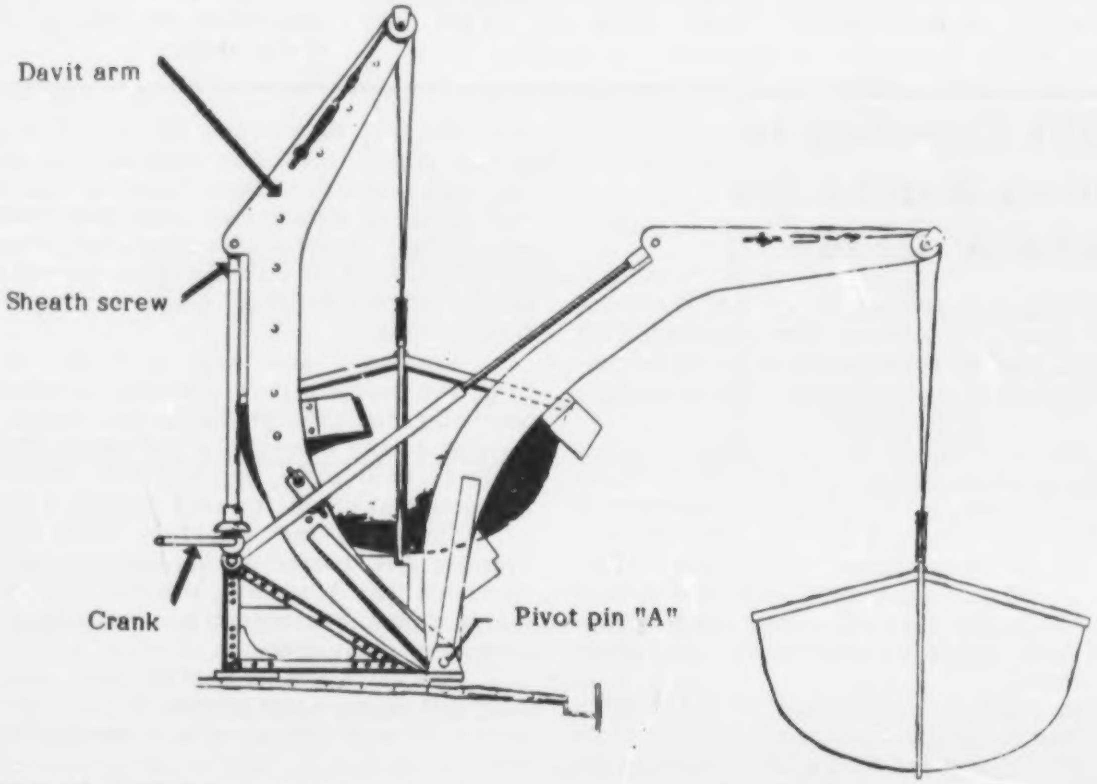
Figure 1 **Sheath Screw Davit, Crescent-Type**



Keynotes

Notice of Proposed Rulemaking

CGD 80-159, Damage Stability and Flooding Protection for Great Lakes Vessels (7 November)

The Coast Guard is proposing to amend the stability requirements for cargo vessels operating on the Great Lakes of North America. Comments must be received on or before January 6, 1986.

Withdrawal Notice

CGD 84-027, Documentation of Vessels (18 November)

The Coast Guard is withdrawing a notice of proposed rulemaking (NPRM) published November 19, 1984, at 49 FR 45623. The NPRM proposed changing the marking requirements for vessels documented under U.S. laws. The Coast Guard believes that rulemaking requiring the exterior marking of a vessel's official number is not necessary at this time.

Advance Notice of Proposed Rulemaking

CGD 85-061, Intervals for Required Internal Examination and Hydrostatic Testing of Pressure Vessel Type Cargo Tanks on Barges

The Coast Guard is considering amending the regulations that govern internal inspection and hydrostatic test intervals for pressure vessel cargo tanks on barges that transport liquefied gaseous cargoes and Grade A flammable liquids at ambient temperatures. This advance notice solicits information that the Coast Guard believes will be helpful in formulating any future proposed rulemaking. Comments must be received on or before March 3, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours. ⚓

Slight Upswing in Sailing Berths for Academy Grads

Sailing jobs for last June's U.S. Merchant Marine Academy graduates have increased a bit since last year to highlight an encouraging marine employment survey for the federal institution.

Figures compiled on the Academy's class of 1985, which graduated on June 17, indicate that 20 percent of the class is employed in shipboard positions, up 3 percent from the previous year's class surveyed in October 1984. Academy officials are pleased with this upward movement in the face of a very tight market for licensed personnel aboard U.S.-flag merchant vessels.

The Academy superintendent, Rear Admiral Thomas A. King, revealed that in addition to the graduates who are sailing, 14 percent of the 1985 class entered active military duty — most with the U.S. Navy — and 51 percent are employed in the shoreside components of the maritime industry. Rear Admiral King noted that Academy midshipmen must seek their own employment opportunities after graduation, unlike students of the nation's other federal academies, who are assigned to duty in their respective services.

Moreover, according to Rear Admiral King, the numbers show that the overwhelming percentage of 1985 graduates are readily conforming to the intent of a law which does not apply to their class, but will take effect with the class that graduates next June.

This law, the Maritime Education and Training Act, passed by the Congress in 1980, mandates that Academy graduates must work in the maritime industry for a specified period of time after graduation.

According to the 1980 law, graduates must sail as merchant marine officers, serve on active military duty, or work in the shoreside

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LESSONS FROM CASUALTIES

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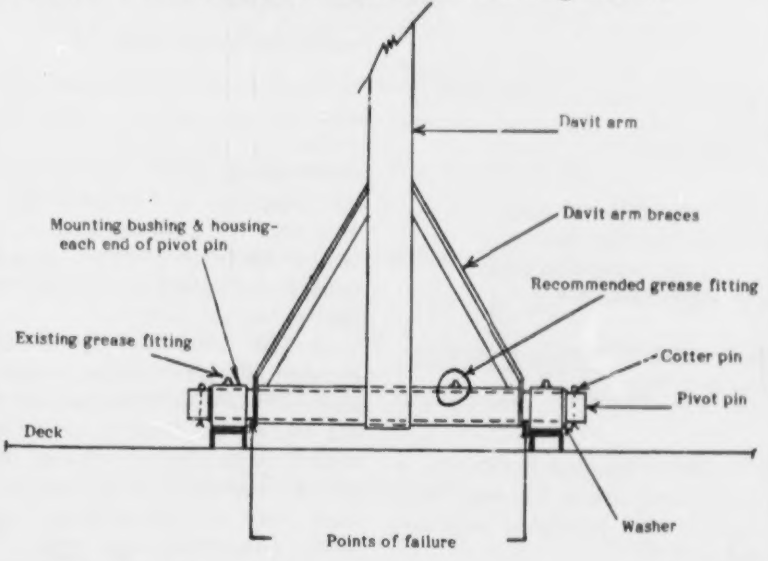
revolving fit of the pivot pin within its two mounting bushings while simultaneously applying a heavy coating of grease inside the cross tube by means of the "recommended grease fitting" shown on the diagram. Such grease inside the cross tube acts as a stopwater, the lack of which will ultimately permit corrosion to start within the tube and wastage of the pivot pin from the entrance of water. Lubrication of these pivot pins should aim for lubrication to (1) ease the movement of the davit arm about its pivot and (2) prevent internal corrosion.

The vessel on which the above incident occurred was of 1958 construction. Given the quarter of a century that the davit was in service, it would be a matter of interest to know how many times it had been taken apart for an examination of its appendages and a check of their lubrication.

The addition of "recommended grease fitting" to the cross tube, figure 2, of the davits of this design now in service will be the subject of a forthcoming change to NVC 4-85, "Recalls and Other Corrective Measures for Lifesaving Equipment," dated 29 May 1985.

Figure 2 **View of Davit Arm's Base Looking Inboard**



ACADEMY GRADS

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maritime industry for 5 years after graduation. Graduates must also maintain their mariners' licenses for not less than 6 years and Naval Reserve commissions for not less than 8 years. Attending an approved graduate school can postpone the terms of the obligation.

The survey shows that 85 percent of 1985 graduates are working in the industry and 2 percent are in graduate school.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. Which component of a refrigeration system is required for a two-box system but not for a one-box system?

A. Hand expansion valve
B. Automatic expansion valve
C. High pressure cutout switch
D. Liquid line solenoid valve

Reference: NAVPERS 10788, Principles of Naval Engineering

2. An LNG carrier has an approved type of gas-detecting system to detect methane leaks in the

A. barrier spaces.
B. cargo handling rooms.
C. boiler burner supply piping.
D. all of the above.

Reference: Wooler, Marine Transportation of LNG and Related Products

3. Excessive humming of AC contactors may be caused by

A. burnt arc shields.
B. shorted armature coils.
C. a broken shading coil.
D. high voltage.

Reference: Hubert, Preventive Maintenance of Electrical Equipment; Smith, Modern Electricity and Electronics

4. The purpose of a heat dam used in some diesel engine cast iron pistons is to

A. concentrate all heat in the piston crown.
B. increase the distance of travel for heat from the crown to the top ring groove.
C. ensure that all heat in the piston crown is conducted to the top ring.
D. provide a short, direct path for heat to flow from the crown to the top ring.

Reference: Stinson, Diesel Engineering Handbook

5. Embeddability is the characteristic of a bearing material which permits small dirt particles to embed themselves in it and is

A. desirable, as it will prevent damage to the journal surface.
B. undesirable, since the embedded particles will score the journal.
C. desirable, as it will assist in keeping the lube oil filters clean.
D. undesirable, since the particles will interfere with lube oil flow.

Reference: Gunther, Lubrication

DECK

1. To determine which grades of cargo that a tank vessel is permitted to carry, you should

A. refer to the vessel's Certificate of Inspection.
B. examine the cargo tanks and fittings.
C. ask the terminal supervisor.
D. check the Loading Order.

Reference: 46 CFR Part 31

2. You would expect to find the LEAST water over a bar at

A. low water neap.
B. low water spring.
C. slack flood.
D. maximum ebb.

Reference: American Practical Navigator

3. Atmospheric pressure at sea level is equal to

A. 14.7 pounds per square inch.
B. 29.92 inches of mercury.
C. 1013.25 millibars.
D. all of the above.

Reference: Donn, Meteorology

4. Under the IALA buoyage system as used in U.S. waters, which buoy may be even-numbered?

A. Mid-channel buoy
B. Unlighted nun buoy
C. Lighted green buoy
D. Spherical buoy

Reference: Dutton's Navigation and Piloting

5. On a gnomonic chart, a great circle track between Los Angeles and Brisbane will appear as a

A. loxodromic curve.
B. curved line concave to the equator.
C. straight line.
D. spiral approaching the poles as a limit.

Reference: Dutton's Navigation and Piloting

ANSWERS

ENGINEERING
1-D;2-D;3-C;4-B;5-A
DECK
1-A;2-B;3-D;4-B;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417. ⚓

The November 1985 issue incorrectly stated that "B" was the answer for "Engineer" question 1 (p. 253). The correct answer is "D," momentary-contact start button. Our apologies for the error.

LETTERS TO THE EDITOR

continued from page 14

ity and stopping distance must also be considered. The IMO guide is directed more to ocean-going ships. We envision our adoption of the IMO guide as a tool for ship designers and plan reviewers to ensure bridge visibility is considered during vessel design.

We maintain that the Master is ultimately responsible for the safe navigation of his vessel or flotilla and that visibility guidelines do not displace prudent seamanship. Just like a speed limit sign when the roads are icy, this minimum standard cannot substitute for good judgment and may not mean the vessel is being operated safely simply because the standard is met.

We appreciate Mr. Deplaix's insight and experience concerning how others have improved their operational visibility, and we thank the editor of this magazine for a chance to comment on his letter. ⚓

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Cover

The recently established Standard Vessel Boarding Program works to prevent transfer operations accidents like this harbor spill. Our story, by LT Clayton W. Evans, begins on page 27. Official U.S. Coast Guard photos were provided by the Public Information Assist Team.

Initial Success of the Standard Vessel Boarding Program

LT Clayton W. Evans
Port and Environmental Safety Division
U.S. Coast Guard

In October of 1983, we made a major revision to one of the Coast Guard's public safety and enforcement programs: the establishment of what we call the "Standard Vessel Boarding Program." We now have initial indications that it **is** successful in improving the effectiveness and efficiency of commercial vessel boarding while reducing Coast Guard presence in vessels with good records.

The standard vessel boarding program does some important things: it targets boarding efforts upon vessels we call "high priority vessels," that is, vessels with histories of poor performance, and it reduces wasteful boarding of vessels that are likely to be in compliance. It also focuses monitoring and examination on human error, the greatest cause of cargo transfer spills and accidents. Finally, it provides uniform boarding procedures for the local Coast Guard Captains of the Port and Marine Safety Offices throughout the United States.

"We intend to make uniform boarding practices the rule." Here, a team of Coast Guard inspectors discuss concerns with ship officers. (Official U.S. Coast Guard photo)

Insights Into Program Efficiency and Effectiveness

About 3 years ago, we analyzed the effectiveness of our safety and pollution prevention vessel boarding program. We found we could be effective in reducing spills and other accidents during cargo transfer operations, if we could board a high enough percentage of all the vessels entering port. But we really didn't have enough people to attain a boarding level that would achieve significant pollution and accident reduction. This suggested a new approach: targeting boarding activity upon vessels with histories of poor performance, and reducing boarding of other vessels.

We also examined the causes of cargo transfer spills and accidents and took a hard look to see if our boarding procedures worked to prevent those incidents. We found most spills and accidents are the result of operational or procedural problems and not materiel or mechanical failure. Over 80 percent of all oil spills during transfer operations are caused by human error. For example, an oil cargo valve problem can usually be traced back to an error made by the person operating the valve. *The revised program directs boarding efforts to focus on human error.*

Boarding data indicated we frequently boarded the same vessels: in port after port, voyage after voyage. This, in part, resulted

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This article was taken from a presentation LT Evans made to the National Safety Congress, Marine Section, on October 29, 1985, in New Orleans, Louisiana.

from the previous program enforcement standards, which required each Coast Guard Captain of the Port or Marine Safety Office to visit a fixed percentage of vessels visiting a port. These standards did not take into account the performance of the vessel or the hazards presented to the port, nor did they allow for the effective use of our limited number of people. *The new program standards place emphasis on vessels whch pose the greatest threat to the port and environment: what we call "high priority vessels."*

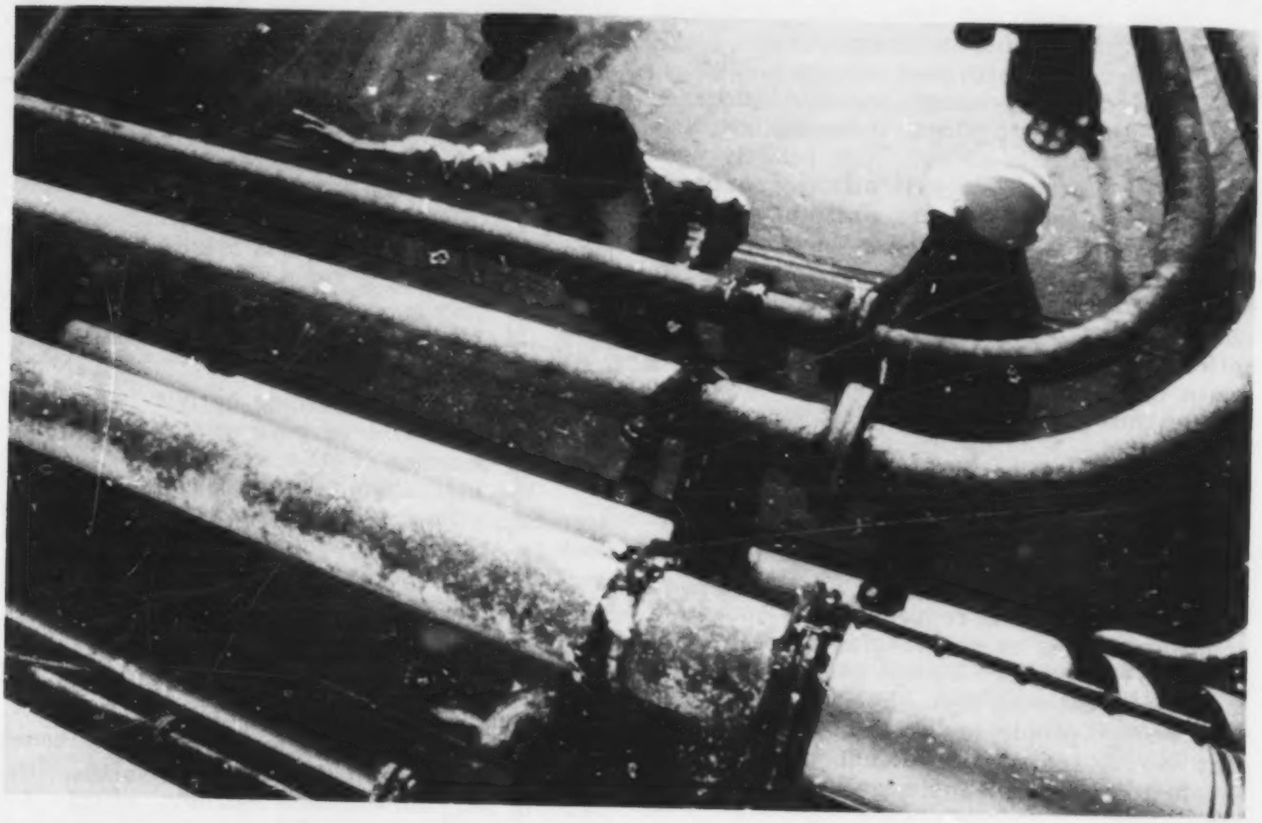
A high priority vessel is a ship or barge targeted for boarding under any one of the following criteria:

- No Coast Guard inspection or examination for 12 months.
- No cargo or fuel oil monitoring for 6 months (for most vessels).
- The first port on maiden voyage to the United States.
- A recent history of violations (specifically pollution prevention, cargo, or safety violations) with no corrective action.
- A recent history of cargo-related accidents (for example, oil spills or leaking hazardous material containers).
- A situation which causes extra concern to the Captain of the Port over safe vessel operation or transfer of cargo.

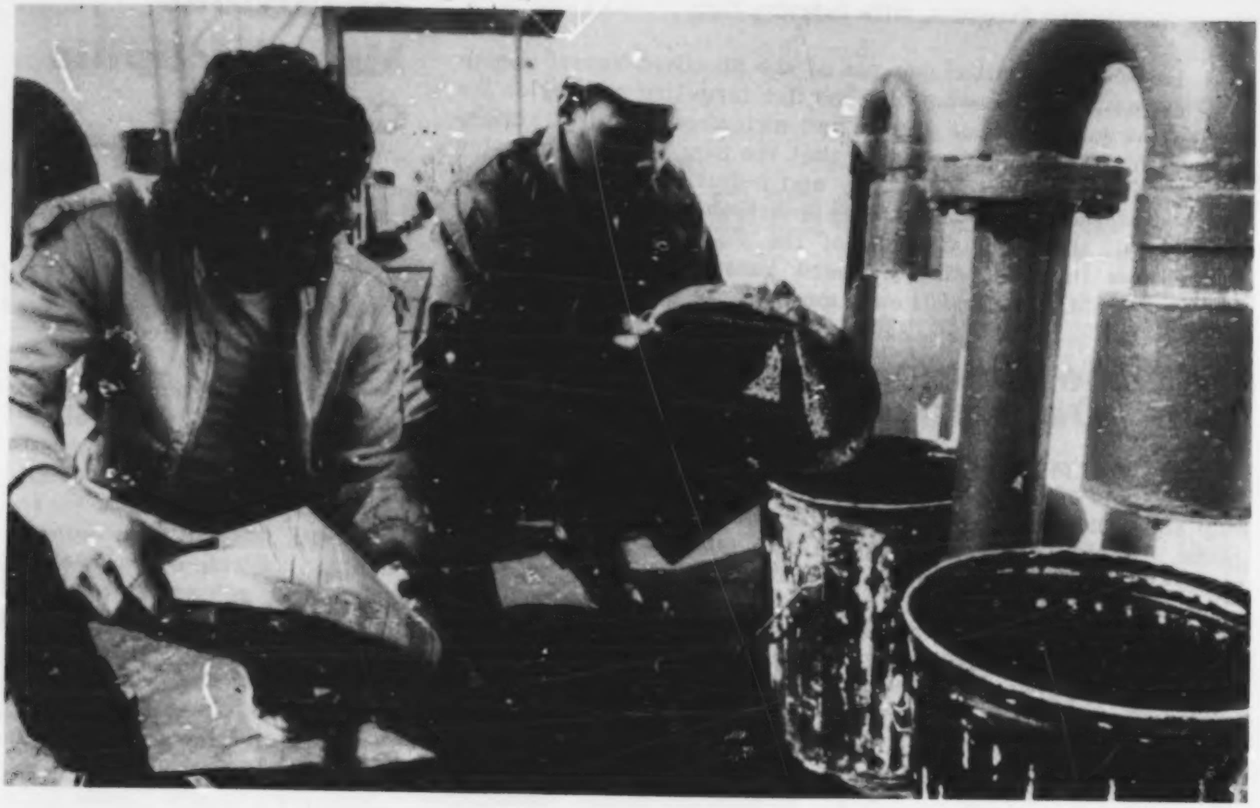
We were also aware that boarding practices had differed widely within districts and across the United States. Standard scenarios are now provided as a guide for examinations and monitorings, and a standard boarding form is almost complete. While the program must be flexible enough to allow for differences in the maritime industry in various parts of the country, *we intend to make uniform boarding enforcement practices the rule.*

Help from the Marine Safety Information System

The computerized Marine Safety Informa-



"The revised program focuses on the human error, as well as the equipment failure, behind most spills and accidents." A Coast Guard boarding officer checks preparations for transfer operations. (Official U.S. Coast Guard photo)



"Emphasis is placed on vessels which pose the greatest threat to the port and environment." A Coast Guard boarding officer examines pollution equipment. (Official U.S. Coast Guard photo)

tion System (MSIS) keeps histories of all vessels in U.S. waters and is used as the primary tool to plan boarding activity. Vessels over 1,600 gross tons are required to give the Captain of the Port or Marine Safety Office 24-hour advance notice of arrival. When this notice is received, the vessel's history is retrieved from the MSIS and evaluated to determine the vessel's priority, and a boarding decision is made. After the boarding, vessel records in MSIS are updated, and MSIS is used to communicate vessel information to other Captains of the Port and Marine Safety Offices.

Initial Indications of Success

We now have initial indications that the Standard Vessel Boarding Program is successful in improving the effectiveness and efficiency of our vessel boardings. The percentage of tank and cargo vessels boarded shows a significant downward trend from the beginning of the program.

While the percentage of vessels boarded is declining, at the same time it appears that a higher deficiency rate is developing. This indicates that with fewer boardings, a higher number of deficiencies per boarding is being observed. Also, more deficiencies with great potential for accidents are being detected. We believe we are seeing a noticeable increase in pollution prevention and cargo system deficiencies.

These are all indications that the targeting of high priority vessels and the improved boarding procedures are doing what we had hoped they would do: improve the effectiveness and efficiency of Coast Guard activities while reducing Coast Guard presence on vessels with good records.

It is important to mention that the personnel hours saved by boarding fewer vessels did not create "excess" people. These personnel hours were used immediately to respond to increasing responsibilities in port contingency planning and enforcement of the new Act to Prevent Pollution from Ships.

continued on next page

Strengthening the Program, with Industry Help

Based on the initial success of the Standard Vessel Boarding Program, we are examining similar targeting strategies for our marine safety harbor patrols and waterfront facility inspections. This all means, we hope, that the people in the industry who work the hardest for safety and pollution prevention will see less of the Coast Guard. We invite the maritime community to tell the local Captain of the Port or Marine Safety Office how **they** see the Standard Vessel Boarding Program working. We'll both benefit **even more** from this program.

Portable Gas Detector Being Developed

A new portable gas detector being developed by the Department of Energy's Argonne National Laboratory could help save the lives of thousands of workers who handle toxic gases. The new device, called a "Chemical Parameter Spectrometer" (CPS-100), is capable of locating and identifying toxic substances in the air.

According to the National Safety Council, about 1,400 people each year are killed by toxic fumes. About 200 of these succumb to gases from toxic chemicals. These fatalities include workers overcome in empty chemical tanks and in transportation accidents involving toxic chemicals.

The CPS-100 is the first device which can identify the type and concentrations of 40 hazardous gases instantly. Weighing only 10 pounds, the portable battery-operated instrument can be used almost anywhere, according to Joseph Stetter, principal developer of the device. "Until now, analyses of this type were lengthy and had to be done in the laboratory," said Stetter.

The CPS-100 is being developed by Argonne for the U.S. Coast Guard's Office of Research and Development. The Coast Guard plans to use the device to aid its Emergency Response Teams in assessing hazards at the scene of a chemical spill and in surveying enclosed spaces such as cargo ship holds. Using the "sniffer," Coast Guard personnel will be able to tell instantly whether it is safe to enter a ship's hold and what chemical cargo it last contained.

Argonne scientists predict that in the future, robots equipped with electronic sniffers could survey hazardous waste sites and report back via radio the types and amounts of toxic chemicals involved. They also see possible applications on future space shuttles to notify crewmen of any toxic gases.

"While early models of the Hazardous Vapor Monitor can identify 40 hazardous gases," said Stetter, "future versions are expected to handle about 100." Continuing research is underway to further miniaturize the CPS-100 and to improve its performance to handle lower concentrations and more complex mixtures of chemicals.

"The Hazardous Vapor Monitor is unique," said Stetter, "because it uses inexpensive, rugged, low-power sensors to do a job that formerly required a laboratory full of expensive equipment. This combined with its ability to instantly analyze toxic gases in the field makes it an important tool for workers in our high-technology society."

Hazardous Material Spills Conference

The 1986 Hazardous Material Spills Conference will be held May 5-8, 1986, in St. Louis, Missouri. The 1986 Conference is the eighth in a series of national conferences held biennially on the preparedness, prevention, control, and cleanup of chemical releases. This year's Conference will continue to focus on major hazardous materials emergencies, prevention of incidents, control of hazardous substance releases from all sources, and pollution abatement in navigable and subsurface waters, soils, sediments, and the atmosphere.

General Information

Attendance at the Conference will be limited; consequently, interested persons are urged to register early. Payment in full or a purchase order should accompany the registration form. Checks or purchase orders should be made payable to Hazardous Material Spills Conference.

Full registration, if received by April 11, 1986, is $195. Thereafter, the fee is $245. **Single day registration** is $90. **Student rates** are available upon request. All fees must be paid in U.S. dollars. Requests for refunds must be received in writing by April 18, 1986. If received by that date, all but a $25 processing fee will be returned.

Requests for additional Conference information should be directed to the Hazardous Material Spills Conference, 655 15th Street, NW, Suite 300, Washington, DC 20005 USA; telephone (202) 639-4366.

The "Penguin" and "Susie" Saved My Life

Joe Gilbert
Gauger, S. Timbalier 86
Ocean Drilling & Exploration Company

In 1982, ODECO management decided to provide each of its drilling rigs and manned production facilities with Imperial survival suits as part of the company's overall safety program. The neoprene suits, nicknamed "the penguin," are designed to prevent hypothermia (loss of body heat which is often fatal) and keep people afloat indefinitely if they are forced into the sea.

ODECO purchased 4,300 suits at a cost of $1.4 million to provide enough suits for 1½ times the normal complement of personnel for every one of its offshore installations around the world. About 2 years later, the U.S. Coast Guard issued a regulation requiring survival suits aboard rigs operating in cold-water regions only.

ODECO's investment of $1.4 million in employee safety paid off in October 1985 for the production workers from South Timbalier Block 86A who were forced into the stormy seas when their platform went down during Hurricane Juan. Here is the story of one survivor who was rescued after more than 20 hours in the Gulf of Mexico.

This article is reprinted with permission from the November 1985 issue of **ODECO Soundings.**

We were in the quarters watching the World Series pregame show on Sunday night when we heard some banging below. We put on our Mae Wests, our life preservers, and went downstairs to anchor a loose pipe on the cellar deck.

We were working there and heard the most ungodly sound I ever heard in my life. It was like a locomotive. We were standing an estimated 50 feet above the water, but we had to look up to the waves. That's how high it was, a solid wall of water coming over the top of us. The waves just started to wipe everyone out.

Another wave hit, and the platform started self-destructing. It folded the handrails in, which caught my leg. As it hit the water, I was still hung, and it was taking me down. Then it hit something and put a bend in the handrail and relieved the pressure. I got free and came to the top of the water.

Here I was with nothing but a life jacket on in the middle of the Gulf of Mexico at 7 o'clock at night. It was dark with high winds and high seas. We were still getting 50-foot killer waves. My first impression was "My God, why me? Not me, not out here."

And then I started hollering to see if anyone could hear me. But the way the winds were blowing, they couldn't hear me, and I couldn't hear anyone else. I started wondering, "Am I the only one who made it?" All through the night and up until 4:00 or 4:30 Monday afternoon when I was rescued, I thought I was the only one who made it out.

I was in the water maybe 15 or 20 minutes with just a life jacket on, being picked up, beaten, and slung around by the waves. I started praying. I needed some help. I was going to try to help myself, but I needed some help.

About 10 or 15 minutes later, one of our survival suits came floating by. I put a

From his bed in Ochsner Hospital, Gauger Joe Gilbert tells of his harrowing experience. (Photo courtesy of ODECO.)

death grip on it. It was about an hour later before I could really get up enough courage to attempt to put it on in 30- to 40-foot seas. Of course, our Safety Department gave us periodic instructions on how to put the survival suits on, but this was done on the platform. We've always been told you could put it on in the water, but I don't think anyone really believed that. But seeing is believing. You can.

I put one leg in at a time. When I got it on up to my waist, I undid the life jacket. I took a death grip with my teeth holding onto the life jacket to keep my head out of the water. One hand in at a time. I pulled the hood up. Once I zipped it up, I turned loose of the life jacket. I was still in 30- to 40-foot seas, and I said to myself, "Well, I'm going to find out if this thing floats."

When I turned loose of the life jacket, I was on top of the water. The waves would hit me, spin me, toss me about 15 or 20 feet under the water, and I would be rolling. As soon as I hit the trough, I would come back on top of the water, just like a cork.

Later on, a board came floating by. It was one of the 9" by 13" planks from the top deck of the platform. It was roughly 10 to 12 feet long, but it had nails in each end, so I had to be conscious of those nails. I named the board "Susie," and I talked to that board all night and all day long. I even sang to it, "If you knew Susie like I know Susie..." and also some sailor songs that I can't mention here. I did that to try to keep awake. As time went on and daylight grew closer, I got so I could maneuver my board with my body as a rudder. If I wanted to go left, I would get on the right side of it, and the board would move left. If I wanted to go right, I did the opposite. If I wanted to go straight, I got in the middle of the board. My only regret is that I lost my board when they rescued me.

Perhaps you're wondering where the survival suit came from. We usually keep them in a locker on deck, but when the winds and seas kicked up on Sunday afternoon, I told Tony Cuchinelli, the head gauger, that I'd get five survival suits out of the locker and put them out. So when the platform went down, the survival suits floated out, and three of us found them.

I believe I was probably the first one to find a survival suit. I later learned that Tony found one and put it on. About 10 minutes later, another one floated by, and Tony gave it to Jackie Anthony, who was with him. Tommy Davidson, Bob House, and I were all separated.

I guess the best sight, the prettiest sight I ever saw was the the rescue boat, the ALEUTIAN COMMAND. I came up riding the crest of a 30-foot wave and hollered and waved, but it dropped me back down. When I came up again, I didn't see any signs of recognition that they had seen me. Then a 35- or 40-footer picked me up, and I rode the crest and waved again. That's when I saw two deckhands standing outside the wheelhouse waving back. I've got all the respect for them. They did a great job getting me out of the water.

The survival suit didn't hinder me a bit. It's like a wet suit a diver would use. They're not too thick, and once you get into it, you have plenty of movement. But it retains the body heat and the buoyancy. You can't sink in it. Mine lasted 20 hours, and I'm told they will float forever.

Training specialist Don Ducre models one of the survival suits ODECO purchased for its employees. (Photo courtesy of ODECO.)

I was picked up some 22 to 25 miles north of where our platform was. I had traveled that far in 20 hours, so I was doing roughly 1 mile an hour.

The guys on the boat were fantastic. They got me out of the survival suit and my wet clothes, dried me off, and immediately wrapped me in blankets and put me in bed. They were continuously making me something sweet to drink because I was thirsty and dehydrated. When they got ready to transfer me from the boat to the helicopter on the Shell platform, one of the deckhands gave me his clothes to put on. When I told them how much I appreciated the clothes, they told me it's a rule of the sea: "Some day we may have to depend on you all. One good turn deserves another."

ODECO Directs Air/Sea Search

An extensive search by helicopters and offshore ves-

sels for the five men from South Timbalier Block 86 "A" platform was launched at daybreak on Monday, October 28, 1985, and continued throughout the stormy day until all hands were rescued.

Production Superintendent Vay Carboni directed the search efforts by five helicopters and as many offshore supply boats in the Gulf of Mexico area between South Timbalier Block 86 and the Louisiana coastline.

U.S. Coast Guard search and rescue helicopters found and flew to safety the first four platform workers within a few hours after the search began. The helicopters and boats continued running search patterns for the rest of the morning and throughout the afternoon until Gauger Joe Gilbert was sighted and was safe aboard the vessel ALEUTIAN COMMAND between 4:00 and 4:30 p.m.

Production Vice President Herb Price expressed his appreciation to Champlin Oil, which released the ALEUTIAN COMMAND as the standby boat for the OCEAN CHIEF to aid in the search, and to its owners, Command Marine of Lafayette, Louisiana. Price also thanked for their assistance the U.S. Coast Guard, Era Helicopters, Chevron, PHI Helicopters, Exxon, McDermott, Mark Producing and Air Logistics, all of which provided helicopters for the search; Tidewater, Skippin Sue and John E. Graham, which provided search boats, and Shell Oil Company, which permitted use of its platforms in the South Timbalier area. ⚓

Isn't it time
for YOU to become
familiar with exposure suits
and their uses?

U.S. House Approves TITANIC Site As Memorial

The U.S. House of Representatives recently approved by voice vote a bill to designate the wreck of the R.M.S. TITANIC an international maritime memorial, Representative Walter B. Jones (D-NC), Chairman of the Merchant Marine and Fisheries Committee and sponsor of the bill, announced in December 1985.

"This legislation seeks to enlist international cooperation so the countries interested in the shipwreck will conduct research, exploration, and, if appropriate, salvage in a manner befitting this historic wreck," Chairman Jones said. "The technology that found her could destroy her. We must not let this happen. The American leader of the joint U.S.-French venture that found the TITANIC, Dr. Robert Ballard, feels this bill is a step toward protecting her special place in maritime history, and I agree."

"The TITANIC story, as we all know, is tragic," Chairman Jones continued. "Touted as the most elegant liner of its time and billed as unsinkable, she struck an iceberg on her maiden voyage and went down, carrying 1,513 passengers to their deaths. Just as the TITANIC disaster was a turning point in introducing tougher safety standards for vessels throughout the world, so should the discovery of her signify the development of international guidelines for dealing with wrecks found in international waters."

The bill directs the Secretary of State to begin negotiations with interested nations and instructs the Administrator of the National Oceanic and Atmospheric Administration (NOAA) to develop guidelines governing activities at the site which (1) are consistent with the ship's historical and cultural significance, (2) promote the safety of individuals involved in any operations, and (3) recognize the sanctity of the shipwreck TITANIC as a maritime memorial. These guidelines should help in framing an international agreement.

"Until an international agreement is reached, the bill encourages research and limited exploration, as long as it enhances public knowledge and the shipwreck is left undisturbed," Chairman Jones explained. "We hope to foster a spirit of cooperation between nations in realizing what we hope is a common goal — protecting the TITANIC and preserving its proper place in maritime history."

The bill must now be passed by the Senate and signed by the President before becoming law. ⚓

The Role of the Marine Safety Council

Monitoring the Regulations

RADM Edwin H. Daniels
Chief Counsel of the Coast Guard

The U.S. Coast Guard Marine Safety Council is an internal organization within Coast Guard Headquarters. The purpose of the Council is to manage, monitor, and serve as a focal point within the Coast Guard for the development of regulations affecting the public. It ensures that all regulatory initiatives are well considered and that they impose no greater burden upon the public than is reasonably necessary.

The Council is composed of eight flag officers: the Chiefs of the Offices of Merchant Marine Safety; Navigation; Operations; Marine Environment and Systems; Boating, Public and Consumer Affairs; Engineering; Research and Development; and the Chief Counsel, who is Chairman of the Marine Safety Council.

The Council is the final recommending authority to the Commandant of the Coast Guard on regulatory initiatives and, in routine cases, acts for the Commandant. The Council advises the program directors with active regulatory programs, most commonly the offices of Navigation; Merchant Marine Safety; Marine Environment and Systems; and Boating, Public and Consumer Affairs; as to the acceptability of their initiatives.

We try to ensure that the proposed regulations will be beneficial and not burdensome, and, particularly, we check proposed regulations which will significantly increase the cost for consumers or for individual industries, geographic regions, or government at any level, and proposed regulations which have a potentially significant adverse effect on competition, employment, investment, productivity, and innovation.

We check proposed regulations to see whether they have a substantial public interest, are controversial, or have substantial impact on current major transportation safety programs or regulatory programs. We also check whether proposed regulations are substantially different from international requirements or standards or otherwise change existing policy of the Department of Transportation.

We take into consideration the type and number of affected individuals, businesses, or organizations; the compliance and reporting requirements likely to be involved; and the relationship of the regulations to other programs and agencies, including the direct and indirect effects.

When a program manager proposes a regulation that would affect the public, such as the maritime industry, the Council members examine these various facets to see whether or not the benefits outweigh the burdens, what the problems are, and try to alleviate any problems before we recommend approval by the Commandant. Significant rulemakings have to go to the Secretary of Transportation before they can be approved.

As an example of regulations that have a direct bearing on the Merchant Marine, we have recently considered manning levels. Many modern vessels require fewer watchstanders than vessels in prior years. However, officers and crew cannot be reduced below a safe number. Obviously a vessel has to have a lookout at all times. With an automatic pilot, no one has to steer the vessel constantly, but someone must be available to steer when necessary, and someone must be on the bridge in charge of the vessel. Likewise, a vessel may have engines with bridge controls so that no one has to be in the engine room, but sufficient personnel need to be available in case of a casualty to those controls.

As a body, the Marine Safety Council does not work directly with the industry, but many of the members of the Council do so in their individual capacities as program directors. However, the Council is the designated sponsor for the statutory Towing Safety Advisory Committee (TSAC), which was created to advise the Secretary of Transportation, and the Committee's recommendations are directed to the Council.

The Chief of the Office

of Merchant Marine Safety and the Chairman of the Council are usually present during TSAC meetings. In addition, the Chief of the Office of Marine Environment and Systems, who manages the ports and waterways program, and the Chief of the Office of Navigation attend whenever a subject is being discussed which falls within their programs. The recommendations of TSAC are tendered directly to the Council, and the minutes are sent up to the Commandant and the Secretary.

Keeping in mind the current administration's policy on deregulation, Coast Guard program managers constantly monitor the effectiveness of existing regulations within their areas of responsibility, and they recommend changes to the Marine Safety Council when appropriate.

They work very closely with industry, and they receive suggestions on what needs to be done directly. Our program managers rely on several other highly regarded advisory committees for assistance in this respect, most notably the Chemical Transportation Advisory Committee, the Rules of the Road Advisory Council, and the Boating Safety Advisory Council.

When industry or an advisory committee makes a recommendation for a regulatory change and the recommendation has merit, the program director brings a work plan before the Marine Safety Council which shows what we plan to do and how we plan to accomplish it. The Council discusses the details of the plan before the staffs go to the trouble of drafting regulations. This work plan review has been very effective.

We are very interested in obtaining industry views on our regulations. For virtually all rulemaking projects, a Notice of Proposed Rulemaking is published in the Federal Register, and we typically offer comment periods of 60, 90, or more days to ensure that those affected will have time to become aware of the proposal and respond.

We use direct mailings and trade publications to help spread the word. There are a lot of smart, experienced people out there. We get comments from licensed officers, seamen, and engineroom personnel, as well as managers and chief executive officers. They are highly professional, frequently feel strongly about an issue, and have the experience to suggest practical alternatives. Our final rules are frequently improved by their contributions. ‡

Reprinted with permission from the August 1984 issue of ***News Briefs****, published by the American Maritime Officer's Service.*

All in a day's work . . .

LTJG Richard L. Arnold (left) of USCGC POINT HEYER and LTJG Randall L. Getman of the NAS Alameda Explosives Ordnance Team examine a World War II torpedo warhead that was caught in the nets of a fishing vessel about 30 miles west of San Francisco. The POINT HEYER took LTJG Arnold and Hull Technician 1st Class Scott A. Warren to the dragger. They removed the warhead from the fishing vessel to be safely exploded. (Official U.S. Coast Guard photo by PA1 Paul Powers, 12th District)

Marine Safety Manual, Volume III, Now Available

The **Marine Safety Manual** (MSM) is a 10-volume publication which provides information and guidance to Coast Guard personnel assigned to marine safety duties. First published in 1978, the MSM is being revised to update the subject matter and to comply with the Coast Guard Directives System. Volume IV, "Technical," was published in December 1984, and Volume II, "Materiel Inspection," was published in October 1985.

Seven of the volumes will be available to the general public when revision has been finalized (two volumes are being developed and one is classified):

Volume No.	Title	COMDTINST No.
I	Administration and Management	M16000.6
II	Materiel Inspection	M16000.7
III	Marine Industry Personnel	M16000.8
IV	Technical	M16000.9
V	Investigations	M16000.10
VI	Ports and Waterways Activities	M16000.11
VII	General (MOUs, Acronyms)	M16000.15

The third of the revised MSM volumes, Volume III, "Marine Industry Personnel," is now available from the U.S. Government Printing Office (GPO). For your convenience, we are including a GPO order form in this publication.

Volume III presents the authority, background, and rationale for the various activities performed by the Merchant Vessel Personnel Division (G-MVP) at Coast Guard Headquarters and the regional examination centers (RECs) located throughout the United States.

Similar notifications will be provided in the **Proceedings** when the remaining MSM volumes are published.

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Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. All MS contacts are opened and closed by means of

A. operating coils.
B. magnets.
C. manual operation of the master switches.
D. solenoid switches.

Reference: NAVPERS 10546, Electrician's Mate 2 & 3

2. Which part of a large, slow-speed, main propulsion diesel engine is under tension when the engine is running?

A. Bed plate
B. Column
C. Entablature
D. Tie rod

Reference: Harrington, Marine Engineering

3. The last two digits stamped on a fuel oil atomizer sprayer plate represent cross-sectional area ratios of the tangential slots and orifice. This ratio determines the

A. density of the oil spray.
B. amount of atomization.
C. angle of the cone.
D. capacity of the atomizer.

Reference: Osbourne, Modern Marine Engineering Manual, Vol. 1

4. Which statement is true concerning boiler inspections?

A. The marine inspector may require any boiler to be drilled to determine its actual thickness any time its safety is in doubt.
B. At the first inspection for certification after a watertube boiler has been installed for 10 years, it shall be gauged by drilling to determine the actual extent of deterioration.
C. If the thickness found as a result of gauging is less than original thickness, the boiler must be condemned.
C. Any user of a nondestructive testing device must demonstrate that results with an accuracy of plus or minus 1 percent are consistently obtainable.

Reference: 46 CFR 61.05-10(f)

5. A reheater in an air conditioning system is designed to control the

A. dry bulb temperature.
B. primary air temperature.
C. dew point temperature.
D. chilled water temperature.

Reference: Althouse, Turnquist, and Bracciano, Modern Refrigeration and Air Conditioning

DECK

1. When a block and tackle is "rove to advantage," this means that the

A. blocks have been overhauled in preparation for hauling.
B. hauling part of one tackle is attached to the hauling part of another tackle.
C. hauling part leads from the movable block.
D. hauling part leads from the standing block.

Reference: American Merchant Seaman's Manual

2. Mean low water is correctly defined as the average height of

A. the surface of the sea.
B. high waters and low waters.
C. all low waters.
D. the lower of the two daily tides.

Reference: American Practical Navigator

3. A splice that can be used in running rigging, where the line will pass through blocks, is a

I. long splice.
II. short splice.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

Reference: American Merchant Seaman's Manual

4. Which statement is true concerning low pressure atmospheric systems in the Northern Hemisphere?

A. They move generally from west to east.
B. They always move in the

opposite direction of a corresponding high pressure system.

C. They usually bring clearing weather.

D. They are follwed by very high, thin, and fibrous clouds.

Reference: Donn, Meteorology

5. What department of the U.S. government issues charts of U.S. waters, Coast Pilots, Tide Tables, and Tidal Current Tables?

A. National Ocean Survey

B. Defense Mapping Agency

C. U.S. Coast Guard

D. U.S. Naval Observatory

Reference: American Practical Navigator

ANSWERS

ENGINEER
1-C;2-D;3-C;4-A;5-A
DECK
1-C;2-C;3-A;4-A;5-A

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417. ⚓

Keynotes

Final Rule

CGD 85-042, Notice to Mariners/Light Lists (13 December)

The Coast Guard is revising the Marine Information regulations in Part 72 of Title 33 by making editorial changes to update certain sections and by increasing the number of Light List volumes published to seven volumes. The current regulations provide for five Light List volumes distinguished by the area covered. The change in the number of Light Lists is being made due to the anticipated increase in size and price of Light List Volumes I and II, covering the Atlantic and Gulf of Mexico coasts.

Interim Final Rule

CGD 85-094, Licensing of Pilots; Annual Physical Examination (23 December)

This amendment will permit first-class pilots to take the required physical examination at any time during the calendar year, with the stipulation that the time between each physical examination may not exceed 13 months. This rule provides flexibility in scheduling physical examinations in order to accommodate the employment practices in the Merchant Marine.

Advance Notice of Proposed Rulemaking (ANPRM)

CGD 85-061, Intervals for Required Internal Examination and Hydrostatic Testing of Pressure Vessel Type Cargo Tanks on Barges (3 December)

The Coast Guard is considering amending the regulations that govern internal inspection and hydrostatic test intervals for pressure vessel cargo tanks on barges that transport liquefied gaseous cargoes and Grade A flammable liquids at ambient temperatures. In response to industry requests, the Coast Guard is currently studying the effects of extending the intervals between internal examinations and hydrostatic tests of these tanks, and investigating acceptable alternatives to hydrostatic testing of these tanks. This advance notice solicits information that the Coast Guard believes will be helpful in formulating any future proposed rulemaking. Comments must be received on or before March 3, 1986.

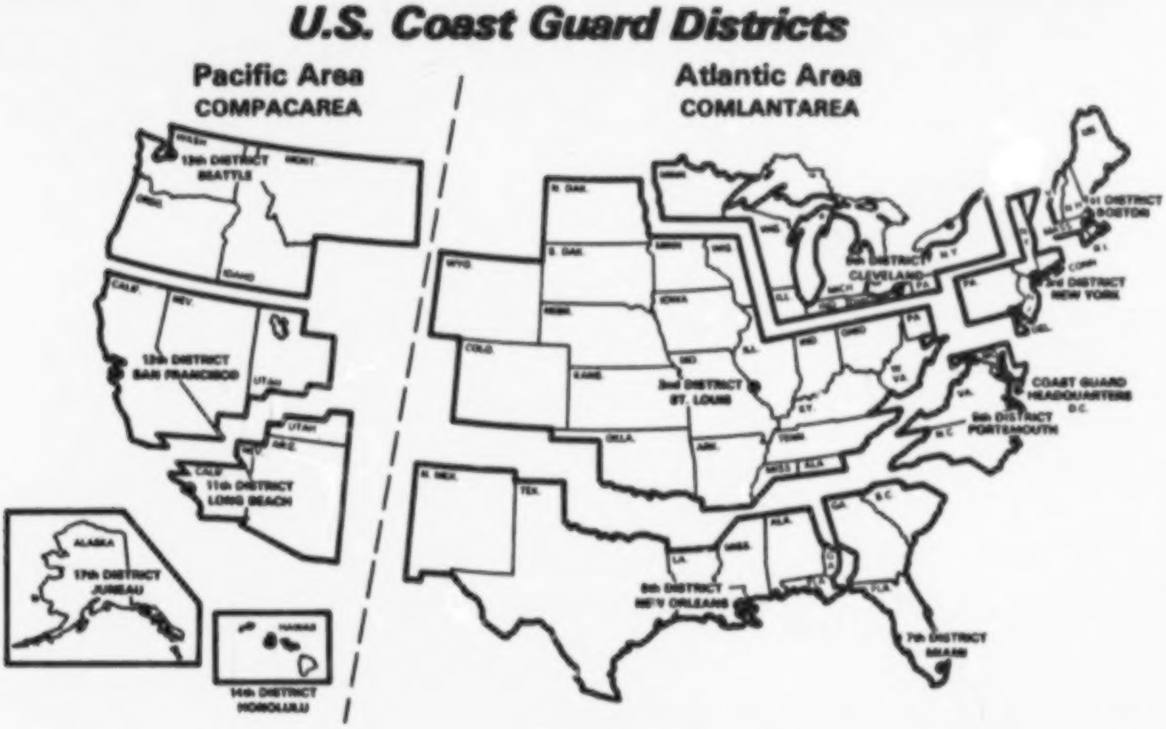
Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours. ⚓

Hazardous Chemical Guide

The Hazardous Chemical Data Manual, 2,200 pages of information describing the chemical and physical characteristics of more than 1,200 chemicals, is now available. The newly revised manual is part of the U.S. Coast Guard's Chemical Hazards Response Information System (CHRIS), and is useful to all of those who are involved in the transportation of hazardous materials.

The new manual may be ordered from the Superintendent of Documents, Government Printing Office, Washington DC 20402; telephone (202) 783-3238. Order CHRIS Manual II, stock number 050-012-00215-1, and enclose a check or money order for $41.00. (Do **not** use the order form on page 36.) ⚓

For quick reference:



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NOTE

In the late 1940s, the Coast Guard consolidated a number of districts, thus eliminating Districts 4, 6, 10, 15, and 16.

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of the Marine Safety Council

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Cover

Automated propulsion throttle runaways have resulted in damage similar to that sustained by this vessel. The article on page 43 presents some of the Coast Guard's findings on this safety problem. (Official U.S. Coast Guard photo)

More on Propulsion Throttles

LT Peter L. Randall
Marine Technical and Hazardous Materials Division
U.S. Coast Guard

The April 1985 edition of **Proceedings** included a brief article on automated propulsion throttle runaways. It warned of a potential safety problem caused by the failure of propulsion throttle controls and stated that the Coast Guard was trying to identify a specific common cause or causes for the problem. About the same time, early 1985, the Coast Guard's Office of Merchant Marine Safety issued a "safety advisory" on throttle runaways to the industry and to Coast Guard marine inspectors.

Why These Actions Were Taken

In late 1984, the Office of Merchant Marine Safety learned of a nearly disastrous throttle runaway on a foreign flag tanker that was offloading overseas. At the same time, details of implementing the new SOLAS Regulation II-1/31.2.7 were under consideration. This regulation requires propulsion controls on new vessels in international service to maintain the preset speed and direction of thrust upon failure and to sound an alarm. As a result of the reported runaway and the new regulation, the Coast Guard looked more closely at past casualty information. Some definite trends were noticed, and the safety advisory was issued.

The Seriousness of the Problem

To date, there have not been any injuries, but there has been substantial property damage. The following examples occurred between 1972 and 1985, and speak for themselves.

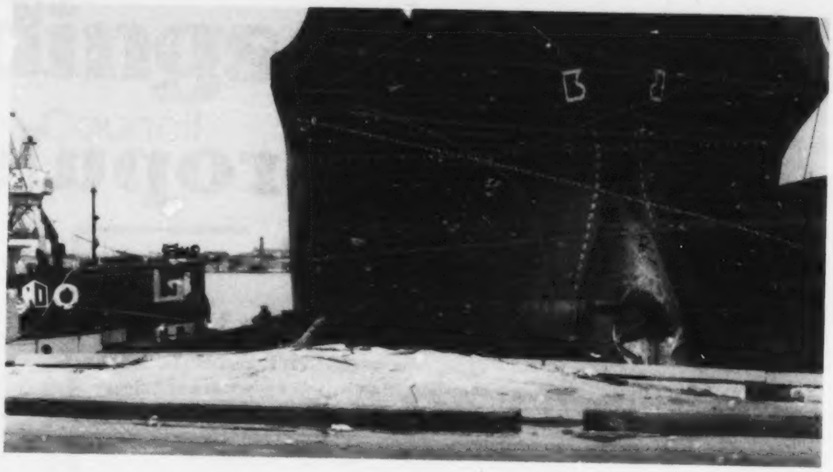
- A steam vessel's throttles failed and ran away while moored. Lines parted, and the gangway was destroyed.
- A steam vessel's throttles ran away while locked in the Panama Canal. Quick closure of the main steam stop by the crew avoided major damage.
- A steam tanker's throttles ran away while discharging oily ballast while moored. Substantial pollution resulted.
- A steam tanker's throttles ran away while moored and preparing to offload cargo. Mooring lines parted, and the loading arms were destroyed.
- The controllable pitch propeller (CPP) control system on a large passenger vessel failed while mooring, resulting in full propeller pitch and the ramming of another passenger vessel.
- A Navy auxiliary's steam throttles ran away while moored. The lines parted, and another vessel was rammed.
- A vessel's CPP propulsion control system failed while mooring. The vessel's stem was laid open when it rammed the pier.
- A diesel tanker's throttles ran away while picking up the pilot. No injuries or damages were reported.

The list goes on, and the Coast Guard is presently evaluating casualties that occurred in 1985. Casualties have occurred to steam, diesel, and CPP propulsion systems, and both electronic and non-electronic propulsion control systems have failed.

Causes

Based on the information available from the casualty reports, some common causes have been identified.

One particularly dangerous cause is the failure of feedback components in automatic shaft speed control systems. In this type of system, the operator's throttle setting is compared to either the shaft speed and direction, or to the throttle's position, and the difference is automatically amplified and used to open or close the throttle. Such governing systems are common for automated steam throttles in the "maneuvering mode" and on both steam and diesel throttles having acceleration/deceleration programs. Unfortunately, some systems may be what control system engineers call "open-loop unstable," i.e., failure of the speed feedback signal results in maximum throttle. One manufacturer found that when a fuse supplying power to the feedback device opened, the throttle opened fully. Some operators have found that throttle valve position feedback potentiometers are unreliable on their vessels and have installed comparator circuits to detect and trip throttle runaways.



This vessel collided with the pier, damaging both. The captain ordered "stop," but the propulsion control system failed to "full ahead." (Official U.S. Coast Guard photo)

Controllable pitch propeller systems appear to have an "Achilles heel" similar to loss of feedback. These systems often establish propeller pitch setting by comparing the operator's throttle setting to a reference spring pressure, pneumatic pressure, or voltage. When the reference component or source fails, maximum propeller pitch is frequently the result, and the propulsion diesel eventually stalls.

Both of the above are examples of design flaws, i.e., they can be corrected by redesign. Problems of another sort, such as improper installation and break-in failures, usually manifest themselves at an early stage in a vessel's life. For this reason, regulatory bodies, owners, operators, shipyards, and system manufacturers scrutinize system performance during trial periods. As a result, few of the casualties reported to the Coast Guard have occurred to new vessels.

Unfortunately, lack of **proper** maintenance frequently appears to result in propulsion control casualties. In electrical control systems, common causes are dirty contacts, loose printed circuit cards, and improper handling of components. In pneumatic control systems, control air that is wet, dirty, and lacks proper lubrication can be the culprit.

The following is a list of causes that have led to throttle runaways:

Diode failure.
Limit switch failure.
Circuit card failure.
Sticking of control air valves.
Control air seal failure.
Speed feedback circuit failure.
Control air valve failure.
Feedback sensor failure.
Fuse failure.
Dirty contacts.
Synchro failure.
Partial or complete loss of power, air pressure, or hydraulic pressure to the throttle control system.

Runaway Prevention

The Coast Guard has initiated several actions in an attempt to prevent future propulsion runaways. The first action is to make industry aware of the problem through the safety advisory, mailouts, and articles such as this one. Second, the Coast Guard is stepping up its efforts to identify casualty trends at an early stage so that pre-emptive action can be taken. Third, a Notice of Proposed Rulemaking (NPRM) on Vital Systems Automation was published in the September 23, 1985, Federal Register. In it, the Coast Guard proposes to extend the failsafe propulsion control criteria of SOLAS to most new installations, and to require a failure analysis to ensure that obvious design flaws are not overlooked. For existing vessels, much of the burden rests with the operator to detect and correct design flaws. An operator who experienced a throttle runaway, and who responded to the Coast Guard's safety advisory, offered the following recommendations:

Operators should:

- carry out a failure analysis of the propulsion control system. Find out what happens when components fail.
- institute operator training of all mates and engineers on automated vessels, reviewing operation of the throttle controls, protective devices, and trip systems.
- install a bypass line and orifice around the main steam stop on steam vessels so that the turbine can be warmed up with the main stop closed and steam limited by the orifice.
- install a separate circuit to monitor shaft RPM versus operator setting.

Some additional recommendations from the Coast Guard include:

- confirming proper operation of local and remote emergency propulsion trip devices on a regular basis.
- following the manufacturer's recommended maintenance procedures closely.
- ensuring that local alternate propulsion controls are readily available, operable, and the engineers are familiar with them. Don't wait until the automatic controls fail in congested waters.
- sharing automated propulsion control problems, experiences, and recommendations with the Coast Guard and the rest of the maritime community.

There's no guarantee that we can prevent all casualties resulting from propulsion control failures. However, by having a better understanding of the problem, we can certainly minimize their occurrence and their effects, making navigation safer for everyone. For more information, call LT Peter Randall, U.S. Coast Guard, at (202) 426-2206.

Know Your HazMat Transportation Regulations

"...A shipment that is not prepared in accordance with the hazardous materials transportation regulations may not be offered for transportation by air, highway, rail or water. It is the duty of each person who offers hazardous materials for transportation to instruct each of his officers, agents and employees having any responsibility for preparing hazardous materials for shipment as to the applicable regulations..."

The above excerpt is from Title 49, Code of Federal Regulations (49 CFR), Hazardous Materials Regulations Section 173.1(b). To assist you in meeting your 49 CFR requirements, the Captain of the Port, New York, Hazardous Materials Office, will be holding a seminar on proper use of the regulations on March 20, 1986, on Governor's Island, New York. For further details, call the Captain of the Port, New York, Hazardous Materials Office at (212) 668-7909. Those interested in an in-depth, comprehensive presentation on the 49 CFR Hazardous Materials Regulations should contact Mr. David B. Goodman, Program Manager, Hazardous Materials Safety, Transportation Safety Institute, 6500 South MacArthur Boulevard, Oklahoma City, OK 73125; (405) 686-4824.

National Recreational Boating Safety Program

The Coast Guard has fiscal year 1986 funds available to provide financial assistance to national, nonprofit, public service organizations to help them conduct boating safety activities. This announcement seeks proposals for all types of projects that will promote boating safety on a national level. Innovative approaches are welcome.

Specific information on organization eligibility, proposal requirements, award procedures, and application forms (Standard Form 424) can be obtained by writing to Commandant (G-BP/42), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593 or by calling Mr. Ladd Hakes at (202) 426-1062.

Proposals for boating safety projects must be received by April 25, 1986.

The WHISKEY RUNNER

About 11:00 p.m. on October 27, 1984, the operator of the recreational motorboat WHISKEY RUNNER met some friends in Huntington Harbor, California, and launched the boat, which had been borrowed from Sundown Marine Company of Huntington Beach, California. The operator stated that after launching the WHISKEY RUNNER, they proceeded onboard the boat to a restaurant in Huntington Harbor and docked the boat at the restaurant about midnight. The operator said that he stayed at the restaurant until about 1:45 a.m. on October 28. Outside the restaurant, the operator met some other friends and invited them and their companions to join him on a cruise to the QUEEN MARY, a floating hotel in Long Beach, California. The operator and eight passengers, all of whom were in their twenties, boarded the WHISKEY RUNNER. None of the persons who had accompanied the operator to the restaurant earlier were onboard. Two of the passengers said that they all had been drinking alcohol.

The WHISKEY RUNNER proceeded out of Huntington Harbor, past the U.S. Naval Weapons Station, and through the waters of Anaheim Bay to the open waters of San Pedro Bay. The operator said that it was a calm, clear night, with no moon, but that he saw the North Star. He said that there was about a 1-foot chop. The WHISKEY RUNNER did not stop at the QUEEN MARY, and passengers said that they were not drinking alcohol while they were onboard the boat. The operator said that, during the voyage back from the QUEEN MARY, the eight passengers were all awake and sitting in the passenger area of the boat. He said that he was using the shore lights as reference markers for navigation and that the boat was making about 30 mph (26 knots) as it turned into the entrance to Anaheim Bay. He said that, as he made the turn into Anaheim Bay close to the west jetty, the shore lights were obscured by the west jetty rocks, and he did not see a 12-foot-diameter concrete mooring buoy in the U.S. Navy anchorage until the boat was nearly 5 to 10 feet from it. About 2:50 a.m., the WHISKEY RUNNER struck buoy 0-8 nearly head-on, demolishing the port bow. The WHISKEY RUNNER sank moments later.

Three passengers who had been sitting directly behind the operator (all facing aft) were thrown clear of the boat and survived. The other five passengers, who were sitting on the other side of the boat, did not escape from the boat and died. One survivor, who suffered a broken pelvis, swam to shore, climbed onto the west jetty, and attracted the attention of some persons fishing on the jetty. Meanwhile, another survivor put a survivor on top of the buoy and clung to the operator, who was seriously injured, and awaited rescue.

About 3:00 a.m., the Seal Beach, California, police were notified that someone was screaming for help on the west jetty. After arriving at the jetty, the Seal Beach police talked with the survivor and, about 3:30 a.m., notified the Orange County Sheriff's Department Harbor Patrol, the U.S. Coast Guard, the Orange County Fire Department, and the Long Beach Lifeguard Department of the accident. The Orange County Fire Department boat was the first rescue vessel to arrive at the buoy, and by 4:00 a.m., the crew had rescued the operator and the other two survivors near the buoy. All four survivors were taken to a local hospital by ambulance.

Also responding to the accident were a Coast Guard 41-foot utility boat, a Coast Guard helicopter, and two Orange County Harbor Patrol boats. At 4:30, the Orange County Harbor Patrol began diving operations to recover the other passengers, and by 8:30 a.m., their bodies had been recovered. The Harbor Patrol then recovered the boat and its engine, which had broken free of the boat.

Vessel Information

The WHISKEY RUNNER was a 20.4-foot-long fiberglass ski boat built by North Star Marine Company of Anaheim, California, in

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This article is taken from the National Transportation Safety Board's marine accident report number NTSB/MAR-85/01/SUM. The Editor wishes to thank Mr. Ralph Johnson, NTSB, for his assistance in obtaining the text and photographs.

1983. The boat had a 454 cc, 350 hp, V8 Chevrolet inboard engine with a Berkley jet drive capable of propelling the boat at a maximum speed of about 55 mph (48 knots). The passenger area had six seats. Two seats faced forward, with the operator's seat on the port side. Behind the two forward-facing seats were four seats, two facing aft and two (on either side of the engine) facing forward. Since the WHISKEY RUNNER was more than 20 feet in length, it was not required by the Coast Guard to meet flotation requirements for small vessels nor was it required to have its maximum capacity (number of persons and maximum weight in pounds) marked on the hull.

The WHISKEY RUNNER was owned by a resident of Anaheim who had left it with Sundown Marine Company (Sundown) to sell. The operator of the WHISKEY RUNNER stated that he had arranged with Sundown to borrow the boat on October 27. Sundown did not provide the boat with any lifesaving or firefighting equipment, nor were they required by Coast Guard regulations to provide such equipment, as is the case for rental craft.

The operator of the WHISKEY RUNNER stated that he put six lifejackets into the boat, but none of the surviving passengers remembered seeing any lifejackets, and none was recovered by the Orange County Harbor Patrol or the Coast Guard. Coast Guard regulations (33 CFR 175.15) state that no person may use a recreational boat 16 feet or more in length unless there is a Coast Guard-approved personal flotation device aboard for each person plus one buoyant cushion.

Bow view (top) and stern view (bottom) of the WHISKEY RUNNER. (Photo courtesy of NTSB)

Whiskey Runner

Waterway Information

The waters of Anaheim Bay constitute a danger zone (33 CFR 204.195). The recreational boater has a number of sources of information available that state the restrictions on boating in Anaheim Bay and its entrance. National Oceanic and Atmospheric Administration (NOAA) chart 18749 shows that the channel through Anaheim Bay is a restricted area regulated by 33 CFR 204.195 and that the area on the east side of the channel is an explosives anchorage governed by 33 CFR 110.215. The NOAA chart clearly shows the location of each mooring buoy located in the anchorage areas on either side of the channel.

Title 33 CFR 204.195 states that the waters between the east and west jetties and the contiguous basin and tidal channel are a danger zone and that no craft is authorized to transit the area without registering with and obtaining a decal from the Weapons Station. However, in fact, the decals are no longer issued or required. The U.S. Navy regularly patrols Anaheim Bay to keep vessels out of the anchorage. Speed limits in the channel are specified by 33 CFR 204.195, which states that vessels shall not exceed 8 knots (9.2 mph) in the outer harbor and 3 knots (3.5 mph) in the inner harbor. A 5-mph (4.3 knots) speed limit in both the inner and outer harbors actually is enforced. The U.S. Coast Pilot states that all the waters inside the jetties of Anaheim Bay are within a danger zone and that an explosives anchorage has been established.

The Orange County Harbor Patrol has posted a large sign at the launching ramp in Huntington Harbor indicating a maximum speed of 5 mph (4.3 knots) through the channel (restricted area) and regularly patrols Anaheim Bay for violations of the speed limits or other regulations. There also is a smaller, unlighted sign in the inner harbor showing the speed and other restrictions. However, there are no signs posted on the jetties to alert occasional visitors entering Anaheim Bay to the speed and other restrictions.

The U.S. Navy mooring buoy which the WHISKEY RUNNER struck was about 12 feet in diameter and rose about 5 feet out of the water. It was not lighted. The mooring buoy and others like it in Anaheim Bay are not lighted because the large chains used to moor ammunition vessels would destroy any lights as the vessels swung around the buoy. Furthermore, the buoys are in waters not open to public navigation. The channel is well-marked by various aids to navigation, both lighted and unlighted. There was a green lighted buoy and a fixed red light marking the ends of the jetties, two unlighted buoys about halfway to the inner harbor, and a fixed red light and an unlighted buoy at the entrance to the inner harbor. The channel is also provided with a lighted range[1] to navigate down the center of the channel.

Daytime photograph of U.S. Navy buoy 0-8. (Photo courtesty of NTSB)

Operator Information

The 28-year-old operator was from Seal Beach. He stated that he had worked on a commercial fishing vessel in Alaska for 3 years and had been in and out of Anaheim Bay approximately 10 times before the accident. He said that he did not know there were U.S. Navy mooring buoys outside the channel and that he had never looked at a chart of Anaheim Bay. The operator stated that he did not know what range lights were.

A test of a blood sample taken from the operator 3-1/2 hours after the accident by the Orange County Sheriff's Department showed that he had a blood alcohol concentration (BAC) of 0.11 percent. California's motor vehcle laws set a blood alcohol concentration of 0.10 percent as the lower threshold to be considered legally drunk.

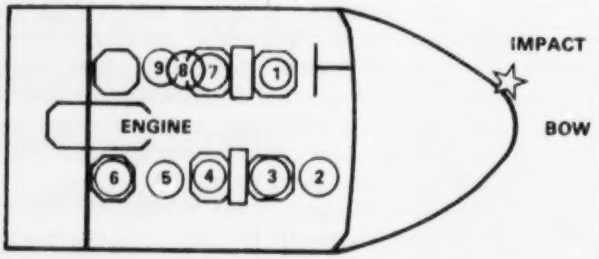
Injuries

The operator was in the left-front, forward-facing seat at the time of the accident. The location of the eight passengers at the time is not precisely known. However, it is believed that two passengers were in the right-front, forward-facing passenger seat (with one person on the lap of the other); three passengers were behind the operator, with one person in the aft-facing seat and the others on the deck facing aft; two passengers were behind the two passengers in the right-front forward-facing seat either in the aft-facing seat or on the deck facing aft; and a passenger was in the right-rear, forward-facing seat. The operator incurred a ruptured lower intestine, a fracture of the right femur, a fracture of the left humerus, and a fracture of the left ankle. Three passengers were thrown from the boat. One passenger had a broken pelvis, a concussion, multiple head and facial lacerations, bruised kidneys, and a ruptured spleen. One passenger incurred numerous muscle contusions and a torn tendon. The other passenger's injuries could not be determined. Divers found the fatalities in the following locations:

---

[1] *Range lights are two fixed lights placed in line as an aid to navigation to indicate a safe track to steer. The rear light is placed higher but in the same vertical plane as the front light. Because of their fixed nature and the accuracy with which a vessel can be positioned by keeping the lights aligned, ranges are among the best aids to navigation.*

Passenger 2:	pinned between right-front seat and dashboard.
Passenger 3:	below deck in forward section, feet toward bow.
Passenger 4:	below deck in forward section, feet toward stern.
Passenger 5:	below deck in forward section, feet toward stern.
Passenger 6:	outside boat with legs through hole in port bow.



This diagram of the WHISKEY RUNNER shows probable seating positions of the operator and the passengers. The operator (1) and passengers 7, 8, and 9 survived.

According to the medical examiner's report, three of the fatalities were due to drowning; these three persons had head and facial injuries as well as other minor injuries to the body. The other two fatalities received more traumatic injuries as a result of the collision and died from loss of blood. Blood, urine, stomach content, and tissue samples from the deceased passengers were analyzed for alcohol and drugs.

Analysis

The operator of the WHISKEY RUNNER had a BAC of 0.11 percent 3-1/2 hours after the accident. In the postabsorptive state, the average or normal rate of metabolism and elimination of alcohol from the human body is approximately 0.015 percent per hour. Assuming that the operator consumed no alcohol between the time of the accident and the time the blood sample was taken, assuming that he was in a postabsorptive state, and assuming that his metabolism and elimination of alcohol follows the normal distribution curve, the operator had a BAC of about 0.16 percent at the time of the accident. A BAC as low as 0.03 percent decreases the ability to distinguish close but separate moving objects. Reaction time and coordination are affected at the 0.05 percent concentration. Reaction time to optical and acoustical stimuli decreases at about 0.08 percent, and at a BAC of 0.10 percent, there is deterioration in judgment, sensory response, and muscular coordination. A 1975 Coast Guard study indicates that when a recreational boat operator's BAC reaches 0.035 percent, the operator is impaired in normal boating operations.[2] With an approximate BAC of 0.16 percent at the time of the accident, the operator of the WHISKEY RUNNER was impaired significantly by his use of alcohol.

The operator probably was experiencing fatigue from the combined effects of alcohol, the partying activities, and the time of day. (It is known that major decrements in performance occur regardless of activity when body temper-

---

[2] *Wyle Laboratories, "Alcohol and Pleasure Boat Operators," prepared for the U.S. Coast Guard, Report No. CG-D-134-75, Washington, DC, June 1975.*

Passenger	Alcohol percentage	Drugs (Ng/ml)	
		9 THC */	COOH **/
2	0.08	0	0.0
3	0.00	0	0.0
4	0.09	2	19.0
5	0.14	0	0.0
6	0.10	0	3.6

*/ Delta 9-tetrahydrocannabinol, one of the psychoactive components of marijuana.
**/ Nonpsychoactive carboxy acid metabolite (an indication of alcohol in the bloodstream).

ature is lowest, which is typical between midnight and 7:00 a.m.[3])

On November 7 1983, as a result of its safety study, "Recreational Boating Safety and Alcohol,"[4] the National Transportation Safety Board issued two Safety Recommendations to several states, including the State of California:

> *M-83-76*
>
> *Adopt legislation to clearly define the level of legal intoxication for recreational boat operators in order to strengthen your State's enforcement program for reducing accidents, fatalities, injuries, and property damage caused by the use of alcohol.*
>
> *M-83-77*
>
> *Adopt legislation to allow a chemical test of blood, breath, or urine if a recreational boating operator is suspected of being intoxicated and toxicological tests in the event of a recreational boating accident fatality.*

On November 29, 1983, the California Department of Boating and Waterways replied:

> *Following a cursory study in 1980 of coroner's reports involving persons who died in boating accidents, we were able to determine that alcohol, indeed, does play a role in fatal boating accidents. For that year, approximately 35 percent of the persons who died (where data was available) were at the legal level of intoxication for persons operating vehicles on the highway. There were a few reports where persons were also under the influence of controlled substances (drugs).*
>
> *As a result, the Department sponsored legislation to increase the penalty for operators who are involved in a serious or fatal boating accident and under the influence. The legislation was successful, and now the penalties prescribed in law for such offenses parallel those for operators of vehicles. The legislation did not, however, contain a blood alcohol level as suggested in your letter.*
>
> *More recently new legislation was enacted that requires the Department to undertake a comprehensive study of the relationship between alcohol and motorboat accidents. The study will span two boating seasons. We are to report back to the Legislature on or before January 1, 1986, with our findings and recommendations.*

Safety Recommendations M-83-76 and -77 have been classified "Open — Acceptable Action" pending the outcome of California's special study and legislative initiatives. As a result of this accident, the Safety Board reiterates Safety Recommendations M-83-76 and -77 to further indicate its concern that the State of California act to enhance its ability to address alcohol-related recreational boating accidents.

Passengers 3 through 6 probably were thrown under the bow section of the WHISKEY RUNNER upon impact with the buoy. There was no correlation between the seating of the passengers and the cause of death, other than that all passengers on the starboard side died. While the boat was carrying more passengers than it had seats, passengers in seats and passengers seated on the deck survived.

When the operator of the WHISKEY RUNNER turned into Anaheim Bay channel, he probably became disoriented because he lost sight of the shore lights and ran out of the marked channel where he collided with the mooring buoy. However, when the shore lights were obscured, the various lighted aids to navigation should have become even more discernible. The channel was well-marked for both daytime and nighttime operation, but the operator had never looked at a chart and was not familiar with the aids to navigation generally, much less the lighted range, an important aid to navigation. By observing the range, an experienced operator would know immediately that he was heading out of the channel.

The WHISKEY RUNNER struck an unlighted buoy. Although a light on the mooring buoy might have warned the operator of the buoy in time to prevent the accident, it is not practical to put lights on mooring buoys of this type. The buoys are well-marked on charts and are located in a reserved anchorage; further, the entire Anaheim Bay has been designated a danger zone where every boat operator must observe specified restrictions. If the operator had been operating the boat at or below the enforced 5-mph (9.2 mph by federal regulation) speed when it hit the buoy, the damage to the boat and the personal injuries probably would have been minor. If the operator of the WHISKEY RUNNER had slowed the boat to 5 mph (or even to 9.2 mph) as he entered the channel, he would have had more time to orient himself in the channel and probably would have remained in the channel. The operator stated that he had operated boats through Anaheim Bay a number of times. He should have been aware of both the speed limit and buoys, but the effects of alcohol apparently impaired his judgment.

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[3] *Akerstedt, T., Torsvall, L., and Gillberg, M., "Sleepiness and Shift Work: Field Studies,"* **Sleep**, *5S95-106, Raven Press, New York.*

[4] *National Transportation Safety Board Report SS-83-3.*

Although federal regulations are explicit in stating that Anaheim Bay is a danger zone, and nautical charts clearly show it is a restricted area, there is a need for a lighted sign on the end of one or both jetties to warn infrequent visitors of the speed limit and that they should proceed with caution. The Orange County Harbor Patrol and U.S. Navy, through education and enforcement, provide adequate warnings to local users of the restricted nature of the waterway. However, the infrequent visitor entering the channel from San Pedro Bay might not become aware of the restrictions unless a Harbor Patrol or U.S. Navy patrol vessel was present at the time.

Recommendations

As a result of its investigation, the National Transportation Safety Board made the following recommendation to the U.S. Naval Weapons Station, Seal Beach, California:

> *Erect a lighted sign on at least one jetty at the entrance to Anaheim Bay indicating the existence of a danger zone and the maximum speed limit. (Class II, Priority Action) (M-85-66)*

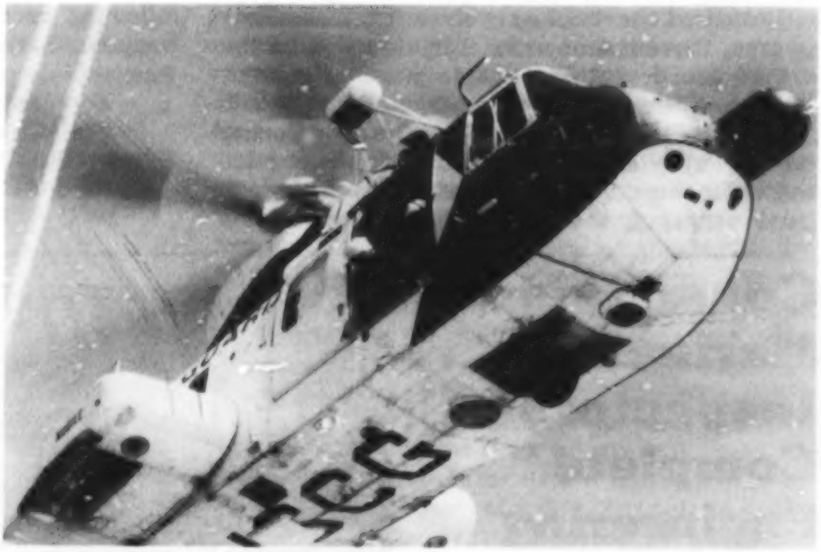
Coast Guard Marine Inspectors Complete Engineering Course

Nineteen Coast Guard Marine Inspectors from Marine Safety Office, San Francisco Bay, CA, recently completed the 5-week "Marine Engineering for USCG Inspectors" class conducted by the California Maritime Academy of Vallejo, CA. The course consisted of 30 hours of instruction held at the Coast Guard Marine Safety Office on Coast Guard Island in Alameda, CA. Various engineering instructors from the California Maritime Academy gave classes in engineroom systems, steam turbines, boilers, pumps, diesel engines, shipboard electrical systems, steering gear, and automated enginerooms. The course was developed by the California Maritime Academy at the request of Coast Guard Marine Safety Office, San Francisco Bay.

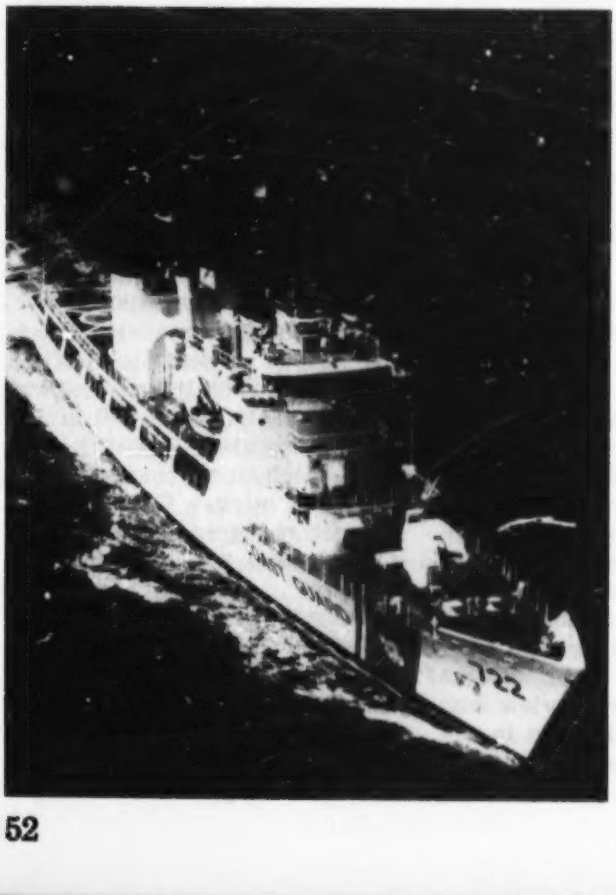
The exchange of ideas by the Coast Guard Inspectors who enforce the regulations and experienced marine personnel who have had to abide by the regulations in operating the merchant vessels was one of the high points of each class. The course included a session at the Engineering Lab of California Maritime Academy. The diesel engineroom simulator was the focal point of this trip and provided an opportunity for the Coast Guard inspectors to view this specialized training aid in action. The diesel engineroom simulator is one of two in the United States and can simulate the actual operation of a slow-speed diesel engine aboard various types of merchant vessels. Over 500 faults can be introduced into the system, which students must identify and solve. Coast Guard inspectors were given their Certificates of Training by Captain David Zawadzki, Commanding Officer, Marine Safety Office, San Francisco Bay, and by Mr. Gale Kubli, Assistant Director, Department of Continuing Maritime Education, California Maritime Academy.

The Coast Guard's Search

As an interesting sidenote in this issue of ***Proceedings****, we'd like to show you some of the vessels and aircraft used by the Coast Guard in accomplishing its many missions. The equipment shown on these pages is employed mainly for search and rescue operations. In a future issue, we will include photos of the Coast Guard's work boats. (Official Coast Guard photos)*



This medium-range HH-3F helicopter, used in search and rescue missions, is distinguished by its "nose." In reality, the nose is the antenna for the weather radar.



This 378-ft., high-endurance cutter, the MORGENTHAU, is homeported in San Francisco. The Coast Guard's 12 high-endurance cutters are situated at various installations nationwide and are employed mainly in law enforcement and fishery patrols.

and Rescue Equipment

This C-130 aircraft has a long-range, low-flying capability for drug interdiction and search and rescue efforts. It pinpoints the location of suspicious vessels or casualty survivors so that cutters or helicopters know where to direct their efforts.

COAST GUARD

The HH-52A helicopter is used for short-range search and rescue missions. The HH-52A will soon be phased out and replaced by the HH-65A, which is outfitted with more sophisticated search and rescue equipment.

Search and Rescue at Sea

The International Maritime Organization's most important task is the adoption of measures to improve the safety of life at sea. Many of its conventions are concerned with this subject and the majority are intended to stop accidents from happening in the first place.

But although these instruments have proved their value, accidents do still occur and may result in the loss of life.

As a result, IMO has adopted a number of measures which are designed to mitigate the effects of an accident at sea and ensure that those involved are rescued as quickly as possible. The Organization's work can be divided into four main areas:

1. Improving lifesaving techniques and equipment on board ships.
2. Distress alerting and signaling.
3. Survival after abandoning ship.
4. Search and rescue operations.

Improving Lifesaving Techniques and Equipment on Board Ships

Requirements concerning lifesaving appliances and related subjects are contained in Chapter III of the International Convention for the Safety of Life at Sea (SOLAS). The current version of this instrument was adopted under the auspices of IMO in 1974 and entered into force in 1981.

It is important that ships should not only be provided with sufficient lifesaving equipment and survival craft, but also that such appliances are readily available, can be boarded quickly, and launched safely and rapidly, even in adverse conditions. The regulations contained in the chapter take all of these factors into account. It is divided into three sections. Part A deals with general subjects, Part B with requirements for passenger ships, and Part C with requirements for cargo ships.

Chapter III of the 1974 Convention was completely revised in amendments adopted by IMO in 1983. These are expected to enter into force on July 1, 1986.

The amendments not only take account of recent developments but also are designed to expedite the evaluation and introduction of further improvements.

Like the existing chapter, the amended version also contains three parts, but the arrangement is very different. Part A deals with such matters as application, exemptions, definitions, evaluation and testing, and production tests. Part B is concerned with ship requirements, and Part C with lifesaving appliance requirements.

Among the most important changes introduced are those involving lifeboats and liferafts.

Generally speaking, the lifeboats required by the current Chapter III of SOLAS 1974 are of the traditional open design, most of them without power. The revised chapter requires that **all** lifeboats be equipped with an engine. They must be partially or totally enclosed, and the latter must be self-righting.

Cargo ships must carry sufficient totally enclosed lifeboats or, in certain instances, self-righting, partially enclosed lifeboats to accommodate all on board. Chemical and oil tankers must carry boats equipped with a self-contained air support system (if the cargo emits toxic gases) or which can afford protection against fire for at least 8 minutes (where the cargo is flammable).

A specified number of the boats carried on board ships should be designed to rescue persons in distress and to marshal survival craft.

The requirements for inflatable and rigid liferafts have also been amended and expanded.

The new chapter requires that survival craft be capable of being launched when the ship has a list of 20 degrees in either direction; the 1974 Convention refers to a 15 degree list.

This article was originally published in the No. 2, 1985, issue of the ***IMO News.***

The new chapter also includes a requirement that lifeboats on ships of 20,000 gross tons and above be capable of being launched when the ship is making headway at speeds of up to 5 knots. This is a new requirement and is in response to the fact that ships have increased greatly in size since the original chapter was drafted and would take much longer to stop.

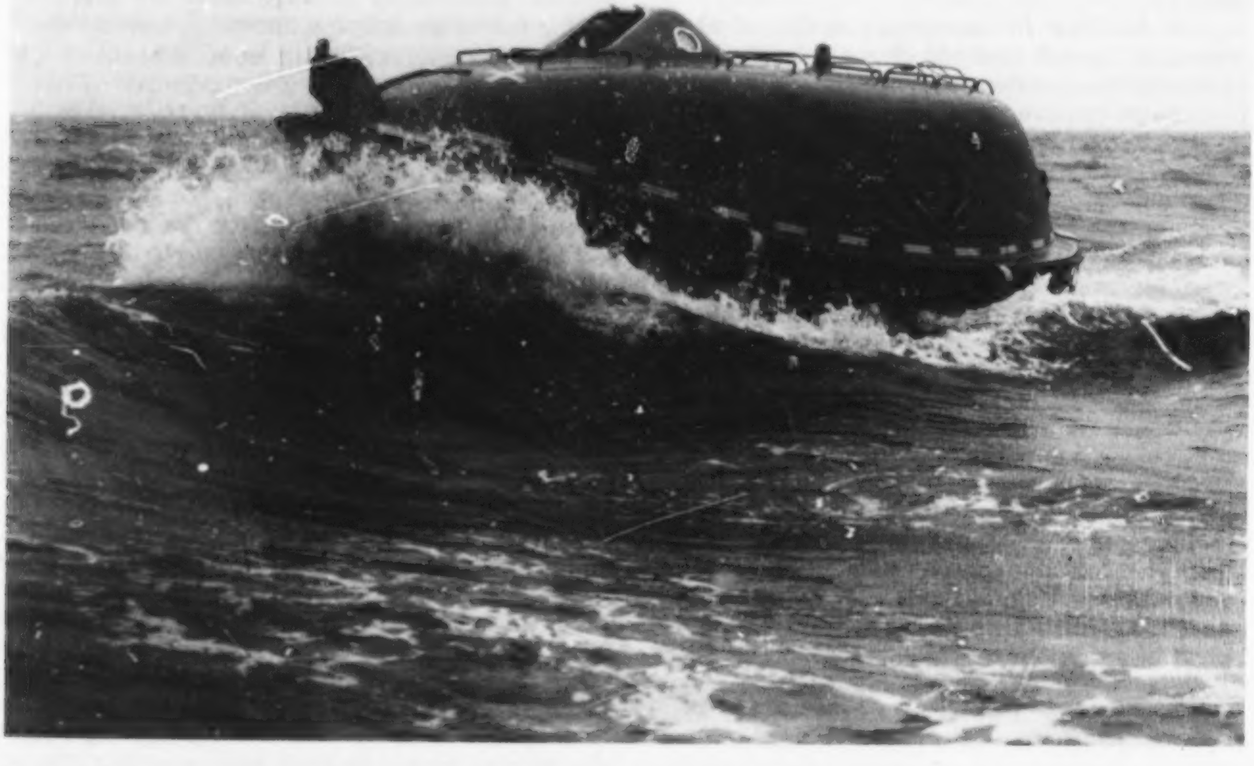
Other requirements are designed to make the stowing, boarding, and launching of survival craft and rescue boats safer.

Although SOLAS is the most important instrument concerned with lifesaving appliances, IMO has also adopted a number of recommendations over the years which have also contributed greatly to improvements in this area. The IMO Assembly in 1983, for example, adopted a recommendation on the testing of lifesaving appliances which is designed to assist the implementation of the revised Chapter III when it enters into force. It also adopted a code of practice for the evaluation, testing, and acceptance of prototype novel lifesaving appliances and arrangements.

Some other recommendations which have been adopted by the IMO Assembly on the subject of lifesaving appliances over the last few years have dealt with the approval of servicing stations for inflatable liferafts (adopted in 1975), fitting of retro-reflective tapes to lifesaving appliances (1973), survival instructions for liferafts (1969), etc. Many of these recommendations have been incorporated as requirements into the revised Chapter III.

Distress Alerting and Signaling

One of the greatest contributions to rescue at sea was the invention of radio. Before that, the most a ship in distress could do to summon help was to fire flares and hope that



The revised Chapter III of SOLAS 1974 requires, among other things, that all lifeboats be partially or totally enclosed. This enclosed unit can carry 33 persons. (Photo by Malcolm Pendrill, Ltd., Surrey, England, from the collection of Robert Markle, Survival Systems Branch, U.S. Coast Guard) another ship was near enough to see them. Radio enabled ships to send distress messages over a distance of hundreds and later thousands of miles.

The advantages of radio for maritime purposes were appreciated from the very early days: the first rescue at sea resulting from a radio message was in 1899, when the lightship on the Goodwin Sands in the Straits of Dover sent a message ashore when the steamship ELBE ran aground, enabling a lifeboat to be launched in time to rescue the ship's crew. It soon became obvious that the use of radio would have to be regulated on an international basis if the new medium was to be properly developed, and the first international conference on radio was held as early as 1906.

Requirements covering radio on ships have formed part of SOLAS ever since the first version was adopted in 1914. In the 1974 Convention, they appear in Chapter IV. This deals mainly with facilities intended for distress and safety purposes.

Passenger ships irrespective of size and cargo ships of 1,600 gross tons and above must carry radiotelegraph equipment (Reg. 3). All cargo ships between 300 gross tons and 1,600 gross tons must be fitted with a radiotelephone (Reg. 4).

In addition, all passenger ships and cargo ships of 300 gross tons and above must be fitted with a VHF radiotelephone installation.

Ships required to be fitted with a radiotelegraph installation must carry at least one radio officer and, if not fitted with a radiotelegraph automatic alarm, must listen continuously on the radiotelegraph distress frequency. For passenger ships, radio watch must be kept for at least 8 hours every day, while ships carrying more than 250 passengers must listen on the distress frequency for at least 16 hours a day (and must carry at least two radio officers). Cargo ships fitted with an automatic alarm must listen on the distress frequency for at least 8 hours a day.

Ships required to be fitted with radiotelephone must keep a continuous watch (which can be by means of automatic alarm) on the radiotelephone distress frequency (2182 kHz). Ships required to be fitted with a VHF radiotelephone must keep a continuous watch on 156.8 MHz (channel 16) and/or on other channels as required by their administration.

Requirements relating to the use of radio in rescue craft are contained in Chapter III of SOLAS. An approved portable radio apparatus must be carried in all ships, except those equipped with a motor lifeboat on each side containing a radiotelegraph installation (Reg. 13). Where more that 199 persons are carried, at least one lifeboat must be equipped with a radiotelegraph station, and where the total number of persons on board is 1,500 or more, every motor lifeboat must be so equipped.

Several additional requirements regarding radio apparatus were introduced into this chapter in the 1983 amendments. They include the carriage of manually activated emergency position-indicating radio beacons (EPIRBs).

While the rapid transmission and reception of distress messages is the most important task of radio at sea, it is essential that warnings be given to ships on matters which can affect their safety. These include the establishment and malfunction of lights, sound signals, buoys and other aids to navigation; the location of wrecks and other hazards; and the establishment of offshore structures.

To ensure such information will be received by all ships likely to be affected by it, IMO and the International Hydrographic Organization (HO) established a World Wide Navigational Warning Service. This service was adopted by the IMO Assembly in 1977, and a revised system was adopted by the Assembly in 1979.

Under this system, the world's oceans are divided into 16 areas (called NAVAREAS). The service includes all arrangements for disseminating information by regular radio broadcasts.

Despite advances in communications at sea, confusion can still arise because of language difficulties. English is generally regarded as the international "language of the sea," but even when both parties speak the language, misunderstandings can still arise because of imprecision in its use.

In 1977 the IMO Assembly adopted a Standard Marine Navigational Vocabulary to overcome some of these problems by standardizing the English terms used in communications at sea.

It is not intended that the Vocabulary be made mandatory, but rather that through constant repetition the phrases and terms used will become those normally used by seafarers for communications between and on board ships.

The most important development in telecommunications in the last 30 years has been the introduction of satellite communications. They enable both radio and printed messages to be transmitted instantly from one place on earth to another, and IMO was quick to appreciate their value for maritime purposes. Research was begun in the 1960s, and in 1976, a conference convened by IMO adopted a convention establishing the International *Maritime* Satellite Organization (INMARSAT).

The establishment of INMARSAT as an independent organization marked a great step forward for maritime radiocommunications. For the first time, shipping had a communications system reserved solely for its own use and designed for its own purposes, and the INMARSAT system offers advantages which cannot be provided by terrestrial radiocommunications.

The Future Global Maritime Distress and Safety System

Despite its widespread use and proven success, there are some disadvantages with the present maritime radiocommunication system. They include the following:

Congestion. The number of terrestrial radio frequencies available for maritime communications is physically limited and cannot be increased. In certain instances this results in congestion, which can be serious since a ship has no alternative means of communication.

Reception facilities. The quality of some messages can be adversely affected by changes in the ionosphere.

Uncertainty of messages being received. The successful receipt of a radio message -- even a distress message — depends on the propagation characteristics of the frequency on which it is transmitted, the geographical location of ships, and the time of day and season. In many parts of the world, the density of shipping is light, and the number of coastal radio stations limited. As a result, it may under certain conditions be impossible for a ship in distress to alert other ships or coast radio stations, or assistance may be delayed for several hours.

These factors could result in a serious delay in a distress message being received and a search and rescue operation being initiated.

However, recent advances in communications technology and the establishment of INMARSAT have provided an opportunity to overcome these difficulties, and IMO is currently working a completely new martime distress and safety system which is expected to be introduced in the early 1990s.

The basic concept of the FGMDSS is that shore search and rescue authorities as well as shipping in the vicinity of a distress will be rapidly alerted to the distress and be capable of being involved in a coordinated rescue operation. *The concept applies to all cargo ships and* passenger ships on international voyages regardless of their geographical location. Additionally, the system will provide for urgency and safety communications, as well as the dissemination of navigational and meteorological information to ships.

The system will use both satellite and terrestrial communications. Satellite communications will be provided by INMARSAT. A distress capability for alerting by satellite EPIRBs will be provided by INMARSAT geostationary satellites as well as by polar orbiting satellites.

Recent advances in communication technology and the establishment of the INMARSAT system have been the catalysts in planning for a future system. A reliable, long-range communication link continuously available will significantly improve the probability of a distress alert being received, and equipment currently being developed will provide automatic alerting in the case of a sudden disaster at sea.

To use this system to its full potential, it will be necessary to introduce a greater shore authority involvement in distress response; improve long-range terrestrial communications, including the use of digital selective calling; and to establish an international search and rescue infrastructure.

In the future system, terrestrial communications will no longer use Morse Code radiotelegraphy but will employ digital selective calling (DSC), radiotelephony, and narrow band direct printing (NBDP).

The equipment to be carried on ships will be designed for simple operation and will be largely automated. The type of equipment will depend on a ship's area of operation.

The introduction of the FGMDSS will greatly improve radiocommunications at sea, especially for distress purposes, but electromagnetic technology has several other applications which are relevant to rescue at sea. Radio direction-finding, radar, electronic navigation systems such as Omega, Decca, and Loran C, and satellite navigation systems are all based on these principles. Although primarily used for navigation, these devices are also useful for search and rescue purposes, and requirements for their carriage are contained in the SOLAS Convention.

The invention of radio and the tremendous advances made in telecommunications technology during this century have been of immense value to rescue operations at sea. The measures introduced by IMO referred to earlier in this article have similarly improved the chances of survival following an accident at sea. But rescue ultimately depends upon help arriving in time.

Survival After Abandoning Ship

The greatest danger to life following the sinking or abandoning of a ship is not drowning, but hypothermia — death from cold.

The sinking of the TITANIC in 1912 provided a dramatic example of the effects of cold-water immersion. Partially due to a lack of preparedness with protective clothing, adequate flotation equipment, and a knowledge of survival procedures, none of the 1,489 persons immersed in the 0°C water was alive when rescue vessels arrived 1 hour and 50 minutes after the sinking. Countless lives could have been saved had they known more of how to cope with cold water; almost all of the people in lifeboats were alive.

During World War II, the Royal Navy of the United Kingdom alone lost about 45,000 men at sea, of whom it is estimated 30,000 died from drowning and hypothermia. Many of those who drowned were incapacitated due to cold.

Many of the improvements introduced into the revised Chapter III of the SOLAS Convention are designed to improve chances of survival by reducing the threat of hypothermia. Most lifeboats, for example, must be totally or partially enclosed. The latter must have rigid covers extending over 20 percent of the lifeboat's length and be equipped with a folding canopy to cover the rest.

While such boats do not offer the same degree of protection as totally enclosed lifeboats, they are easier to board in an emergency, especially on passenger ships where large numbers of untrained persons are involved. And they certainly offer much greater protection against the cold than the traditional open boat. The revised Chapter III requires that totally enclosed boats and some partially enclosed boats must also be capable of righting themselves automatically if they capsize.

As a further protection against the cold, the revised Chapter III introduces a number of requirements regarding the carriage of personal aids against hypothermia. These include immersion suits, which protect the body against heat loss, and thermal protective aids, which perform the same function but do not allow the same freedom of movement.

Further guidance on combating hypothermia at sea was given in 1981 when IMO published **A Pocket Guide to Cold Water Survival.** The guide states:

> *It is important to realize that you are not helpless to effect your own survival in cold water. Body heat loss is a gradual process, and research shows that in calm water at 5°C a normally dressed person has only a 50-percent chance of surviving 1 hour. Simple self-help techniques can extend this time, particularly if the person is wearing a lifejacket. You can make the difference.*

It then goes on to give practical advice on how to combat cold and how to treat victims.

To be continued in the next issue of *Proceedings.*

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. The most inefficient method of voltage reduction from the standpoint of power loss is a (an)

A. capacitor in series with the load.
B. inductor in series with the load.
C. capacitor and inductor in series with the load.
D. resistor in series with the load.

Reference: Hubert, Preventive Maintenance of Electrical Equipment

2. Although accurate tests of boiler water for dissolved oxygen are difficult on board ship, you can be fairly sure of proper oxygen removal by

A. testing frequently for total dissolved solids.
B. maintaining low boiler water pH.
C. giving the boiler frequent surface blows.
D. testing boiler water for excess scavenging agents.

Reference: Pincus, Practical Boiler Water Treatment

3. Which type of bearing is designed to limit end movement and to carry loads applied in the same direction as the shaft axis?

A. Rigidly mounted reduction gear bearing
B. Segmental, pivoted-shore thrust bearing

C. Self-aligning radial bearing
D. Spherically seated, radial bearing

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. 1

4. When using a flame safety lamp to detect low levels of oxygen, you should

A. fuel with a light fuel, i.e., white gas.
B. allow 2 minutes to warm up.
C. light with the igniter.
D. all of the above.

Reference: MARAD, Marine Fire Prevention, Firefighting and Fire Safety

5. A properly adjusted thermostatic expansion valve will have a constant valve opening under a condition of constant

A. supply pressure.
B. suction pressure.
C. refrigerant superheat.
D. compressor speed.

Reference: Nelson, Commercial and Industrial Refrigeration

DECK

1. When rigging a bos'n's chair on a stay with a shackle,

A. secure the shackle to the stay with small stuff.
B. never allow the shackle pin to ride on the stay.
C. seize the end of the shackle.
D. mouse the shackle to the chair.

Reference: American Merchant Seaman's Manual

2. Which statement is true concerning an "inverting type" sextant telescope?

A. It is also known as the "erect image" type.
B. It has one lens less than the erect type.
C. It absorbs more light than the erect type.
D. When only one telescope is provided with a sextant, it is usually of this type.

Reference: American Practical Navigator

3. A marine sextant has the index arm set at zero and the reflected image of the horizon forms a continuous line with the actual image. When the sextant is rotated about the line of sight, the images separate. The sextant has

A. error of perpendicularity.
B. side error.
C. prismatic error.
D. centering error.

Reference: American Practical Navigator

4. Temporary seizings on wire rope are made with

A. marlin.
B. tape.
C. sail twine.
D. wire.

Reference: Knight's Modern Seamanship

5. Which molten substance is poured into the basket of a wire rope socket being fitted to the end of a wire rope?

A. Babbit
B. Bronze
C. Lead
D. Zinc

Reference: Knight's Modern Seamanship

ANSWERS

ENGINEER
1-D;2-D;3-B;4-C;5-C
DECK
1-B;2-B;3-B;4-D;5-D

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

"Preparation of Fire Control Plans" - Paper Available

On October 29, 1985, LCDR William Riley of the Survival Systems Branch, Office of Merchant Marine Safety, presented a paper at the National Safety Congress on the subject "Notes on the Preparation of Fire Control Plans." Copies of the paper are available to interested parties by writing to Commandant (G-MVI-3), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593.

Richard W. Sanders

Styrene Monomer (Inhibited)

Styrene is one of the most important chemicals in the plastic and rubber industries. Although it is not used in its own form, styrene is used in the production of a vast amount of everyday materials. Polystyrene (styrofoam) and SBR (a synthetic rubber used in tires and tire products) are two examples.

Also called vinyl benzene, phenylethylene, cinnamol, or styrol, this chemical was first isolated in the 1800s. It was distilled from a natural resin of certain trees growing in the Americas and Asia. This resin, called storax, was of no industrial significance at the time. Styrene first became important during World War II in the manufacture of synthetic rubber. Later, peacetime uses, especially in high-impact plastics, accounted for its rapid growth.

Styrene is a colorless, flammable liquid. It boils at 145°C (293°F) and has an aromatic odor. Styrene consists of a two-carbon chain (ethene) bonded to a carbon ring (benzene). When reacted, the chemical forms long chains of molecules, called polymers. These polymers are then combined with other materials or themselves to make a desired product. In its own right, there is no industrial use for styrene.

The most important method of production for this chemical is alkylation (chemical addition) of benzene with ethylene to produce ethylbenzene, which is then dehydrogenated (chemical removal of hydrogen) to form styrene. Dow Chemical Company, BASF, Shell Chemical Company, Monsanto, and Union Carbide each developed variations of this method. Styrene production in 1980 was nearly 2,600 metric tons.

Although styrene is mildly toxic, it is considered a relatively safe organic chemical. The reported odor threshold is 0.05-0.15 ppm (parts per million). At concentrations of 200-400 ppm, styrene vapor has transient irritant effects on the eyes. At 400-500 ppm, irritation to the respiratory tract occurs. Still higher vapor concentrations cause depression of the central nervous system. Effects range from drowsiness and stupor to unconsciousness. Prolonged contact with the skin (1 hour or more) causes swelling and blistering. Repeated contact causes cracking and inflammation, which results from deoiling of the skin. Styrene is commonly stored and transported containing 4-*tert*-butylcatechol (TBC) as an inhibitor to self-polymerization. TBC is also a skin sensitizer. Very small quantities of TBC can produce a rash in sensitive individuals.

The current permissible exposure limit set by the Occupational Safety and Health Administration is 100 ppm of styrene per million parts of air averaged over an 8-hour work shift, and an acceptable peak of 600 ppm for 5 minutes in any 3-hour period. Work involving styrene should proceed in areas of adequate ventilation. In areas where this is not possible, or for operations requiring entry into tanks or closed vessels, respirators must be supplied. Employees should use impervious clothing, gloves, face shields (8-inch minimum), and other protective clothing to prevent repeated or prolonged skin contact with liquid styrene. In the event of a spill, contaminated clothing should be placed in closed containers for storage until it can be discarded or the chemical is removed. In no case should the clothing be reworn while still contaminated with styrene.

In case of skin contact with the chemical, the affected area should be washed with soap and water. If sytrene gets into the eyes, they should be washed immediately with large amounts of water, lifting the lower and upper eyelids occasionally. A person who has breathed large amounts of the vapor should be exposed to fresh air. If breathing has stopped, artificial respiration should be performed. Finally, if styrene has been swallowed, do not induce vomiting. In all cases, medical attention should be sought immediately.

Richard W. Sanders was a Second-Class Cadet at the Coast Guard Academy when this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

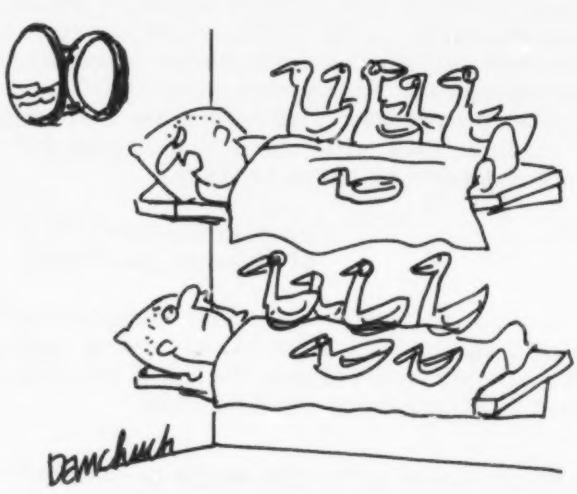
In the event of a spill or leak, a series of steps should be followed for cleanup. First, all ignition sources should be removed, and the area of the spill should be ventilated. For small quantities, styrene can be absorbed on paper towels and then evaporated or burned. Large quantities may be absorbed in dry sand or earth and secured in a sanitary landfill. Persons involved in cleanup should wear protective equipment and clothing. If the spill ignites, firefighting should be done from a safe distance using dry chemicals, foam, or carbon dioxide. Water may not be effective, but it should be used to cool fire-exposed containers, protect firefighters, and flush spills away from the burning source.

Styrene is shipped in a variety of containers. Glass bottles and 1- to 5-gallon cans are used for small quantities. Fifty-five-gallon metal drums are also used. For large amounts, tank trucks, tank cars, and tank barges are employed.

The U.S. Coast Guard lists styrene as a Grade D combustible liquid in its Subchapter O regulations of Title 46, Code of Federal Regulations. The International Maritime Organization includes it in Chapter 6 of its Chemical Code. The U.S. Environmental Protection Agency regulates styrene as a Hazardous Waste under Title 40, Subchapter D, and the Department of Transportation regulations are found in Subchapter C of Title 49 of the CFR. Styrene is listed in the International Maritime Dangerous Goods Code as a Class 3 chemical.

With this issue of ***Proceedings,*** *we are pleased to welcome LCDR J.J. Kichner as our new liaison for "Chemical of the Month" articles.*

Chemical name:	Styrene (monomer)
Formula:	$C_6H_5CHCH_2$
Synonyms:	vinyl benzene phenylethylene cinnamol styrol
Physical Properties:	
boiling point:	145°C (293°F)
freezing point:	-30°C (-23°F)
vapor pressure:	
20°C (68°F)	6.0 mm Hg
46°C (115°F)	304 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	50 ppm
short term exposure limit:	100 ppm
Flammability Limits in Air	
lower flammability limit:	1.1% by volume
upper flammability limit:	6.1% by volume
Combustion Properties	
flash point:	37.8°C (100°F)
autoignition temperature:	490°C (914°F)
Densities	
liquid (water=1):	0.9060
vapor (air=1):	3.6
U.N. Number:	2055
CHRIS Code:	STY
Cargo compatibility group:	30 (Olefins)



"Well, the porthole's open. . .I hope you're satisfied!"

Keynotes

Notice of Proposed Rulemaking

CGD 85-060	Inland Waterways Navigation Regulations; Connecting Waters from Lake Huron to Lake Erie	(January 6)

The Coast Guard is proposing to amend the existing Inland Waterway Navigation Regulations for connecting waters between Lake Huron and Lake Erie. Comments on this proposal must be received on or before February 20, 1986.

Final Rule Correction

CGD 83-005	Sailing School Vessel Regulations	(January 9)

The Coast Guard is establishing a new set of regulations which will establish minimum inspection standards necessary for safe operation of sailing school vessels. These regulations become effective on January 9, 1986.

Notice

CGD 86-001	Rules of the Road Advisory Council; Meeting	(January 16)

The Rules of the Road Advisory Council will meet on Thursday and Friday, March 6 and 7, 1986, at the Lincoln Hotel, 4860 West Kennedy Blvd. at Urban Center, Tampa, Florida. On both days the meetings will begin at 8:30 a.m. and end at 4:30 p.m.

CGD 86-007	Information Concerning the Availability of Voluntary Uninspected U.S. Commercial Fishing Vessel Safety Standards	(January 27)

The Coast Guard has developed a series of Navigation and Vessel Inspection Circulars (NVICs) establishing proposed voluntary vessel safety standards for U.S. uninspected commercial fishing vessels. These standards are advisory in nature and do not modify or supersede any existing or future laws or regulations. The NVICs, which are technical in nature and written for fishing vessel designers, builders, naval architects, marine surveyors, insurance underwriters and vessel owners, are available through the Government Printing Office. Comments and recommendations concerning these standards from interested parties are encouraged. The NVICs will be consolidated into a final NVIC in June 1986 after time has elapsed for the Coast Guard to consider comments. Comments are requested by March 15, 1986.

CGD 86-010	Aquatic Resources Trust Fund; Availability of Financial Assistance	(January 30)

The Coast Guard is seeking to enter into financial assistance agreements with national nonprofit public service organizations for national boating safety activities. This announcement seeks proposals for all types of projects that will promote boating safety on a national level. All proposals must be submitted by April 25, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

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Commandant

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Cover

According to an article in ***Fire Command*** *magazine, stress is the major killer of U.S. firefighters. George J. Munkenbeck, Jr., Codirector of Maritime Education at the Seaman's Church Institute of New York and New Jersey, illustrates how shipboard firefighters can protect themselves during a fire emergency. The article begins on page 67. (Cover photo from the U.S. Coast Guard files)*

Personal Safety During a Shipboard Fire

George J. Munkenbeck, Jr.

Safety should be every crew member's primary concern. During a shipboard fire, matters frequently get out of hand, and safety procedures may be forgotten under the pressure of fighting a fire. Crew members should be aware of the hazards in fighting fires and should remember they are responsible for their own safety as well as the safety of others. While this duty is often thought of as the officers' job, it is, in fact, everyone's job.

An article in the National Fire Prevention Association's publication, **Fire Command**, June 1984, entitled "U.S. Fire Fighter Deaths — 1983," gives a breakdown of what killed shoreside fire fighters in that year. The article notes that smoke-related deaths have declined due to the widespread use of breathing apparatus, but stress is the major killer. In order of importance of **cause** of injury, it lists the following:

Stress	51.9%
Falls, struck by object, contact with object	27.4%
Caught/trapped	15.1%
Structural collapse	4.7%
Exposure to smoke	0.9

The importance of this list is not the data, but what is listed first. Over half the 106 deaths (55 deaths) were stress-related. Twelve of these 55 stress-related deaths were due to physical exertion, and the remainder were due to emotional stress. The figures for death by **nature** of injury are even more revealing:

Heart attack	49.1%
Internal trauma/fractures	27.4%
Smoke/burns	10.4%
Drowning	6.6
Electrocution	3.7%
Stroke	1.9%
Gunshot	0.9%

Also of interest is that the majority of the heart attacks occurred in the age group over 41, the age group of many merchant seamen today. The younger age groups are more prone to trauma injuries, due to the increased number of risks taken by younger persons. Another fact pointed out by the article's statistics was that almost one-half of the fatal injuries occurred while firefighters were involved in non-fire-suppression duties. In other words, fatal injuries tended to occur after the heavy exertion was over.

How does this apply to a seaman who may suddenly find himself in a fire situation? Even for veteran firefighters, the stress of a "worker" cannot be described until you have experienced it. You never really know how your body will react. Most seamen are middle-aged or older, but even younger personnel are not immune to stress. A firefighter ashore can leave the scene of a fire and go home or go back to the firehouse, but that is no guarantee that the job stress will not follow. The seaman, on the other hand, responds to an alarm in the manner of the volunteer fireman, but in the seaman's case, the firehouse is what's burning. You cannot easily escape what has happened because there is nowhere else to go. Any fire service is demanding, but shipboard service is doubly so. We also tend to act without thinking, to go in without a breathing apparatus or make some other mistake that a shoreside fireman may not make, because the shoreside firefighter has a little more time to get ready when responding to alarms.

George J. Munkenbeck, Jr., a 1967 graduate of the Coast Guard Academy, is Codirector of Maritime Education with The Seamen's Church Institute of New York and New Jersey. He is a member of the West Sayville, New York, fire department and is a Commander in the Coast Guard Reserve.

We are all aware of the strain a shipboard emergency puts on the entire crew. I realize in a major fire on a modern ship, everyone will be forced to give 100 percent, but remember at sea there is no "mutual aid," no other department to call on for equipment or manpower, and once your personnel have become exhausted, there are no further resources.

The most important lesson, though, is that your body will be under extreme stress and strain when fighting a fire. The reaction of a particular body to that stress is not predictable. Even more important is that you do not know when or how stress will show up. People have died days later from stress-related injuries which originally went undetected.

Safety Hints

Smoke and toxic fumes are a fact of life in firefighting. The modern breathing apparatus has reduced this hazard, so the danger of asphyxiation is reduced, but a breathing apparatus that is not properly worn, used, or maintained is useless. If you don't know how to use it, why are you wearing it? Practice makes perfect.

The crew of the Coast Guard cutter WHITE HOLLY stands by to assist with firefighting. (Official U.S. Coast Guard photo)

Remember, you are not superhuman, not even with a breathing apparatus. Don't be a hero. Firefighters tend to think they can go anywhere and do anything once they are used to the breathing apparatus. This is not so.

While everyone worries about breathing smoke, we tend to forget that besides having carbon monoxide, sulfur dioxide, and many other delightful chemicals in it, smoke hides dangers. This may be one of the greatest hazards today. Remember, what you **don't** see can kill you.

In light of this, remember that a fall down an access trunk, ladder, companionway, or hatch can kill you faster than fire. So look where you are going, know where you have been, feel your way if you cannot see, proceed with caution, watch slippery decks, be alert for the presence of structural failure, and most of all, **practice teamwork.**

Many firefighters are injured by other firefighters. Structural weaknesses on a ship and on the shore can be spotted in many cases, but flying objects and "booby traps" left by others are far more common hazards. Don't break glass or knock in an access without checking the location of other firefighters. Wear a hard hat and firmly grip tools. If you are clearing out an area, don't drop anything without seeing who or what is below, and if you find a hazard, remove it or secure it. Remember, a ship is in constant motion, so the following safety laws apply:

If it can move, it will.
If you are under something, it will fall.
If you drop something, it will hit someone.

Fire and heat are the enemy. They can burn you, exhaust you, and create a trap if not watched. To lower the possibility of injury, wear protective gear and wear it properly. Always remember that water converted to steam can burn as severely as fire. Have a pre-fire plan and stick to it. Watch for heat buildup and smoldering fires. Remember that heat intensifies fatigue and what may appear to be a rational decision isn't. That's why we emphasize the pre-fire plan at The Seamen's Church Institute. Also remember that the crew does not consist of regular firefighters. Fear and emotion can add to your problems.

Always look for signs of backdraft, and you should feel doors and bulkheads for heat. Stand back from a door or passage as you open it if you suspect a backdraft. If at all possible, ventilate ahead of your attack.

It is easy to become trapped during a fire aboard ship. Teamwork and planning can prevent or at least lessen the chance of being trapped. Always maintain a way out and have alternates in case you are blocked by smoke, fire, or structural collapse. A very simple precaution is to ensure that your safety lights have fresh batteries. If you do become trapped, control your emotions and keep calm. Keep to your hands and knees. Find a hose and follow it out. Most of all, have confidence in your equipment and in your ship's organization. The Safety Officer should always know where the teams are, and if you have a good pre-fire plan, they will get you out.

You can prevent yourself from becoming a statistic. Know your limits. The difference between a hero and a fool is a fine line.

Some personal safety points to remember:

- You are your brother's keeper. Watch each other. Frequently you may continue beyond the point of exhaustion.
- Rotate personnel. If you have reliefs, use them. Plan your attack, and ventilate if you can to reduce the punishment of your personnel.
- Watch yourself. If you are having trouble breathing, or if you feel "giddy" or exhausted, it's time to get out.
- Use a breathing apparatus if available. Use it properly. Let's try to reduce smoke- and fume-related injuries to their shoreside levels.

Remember: Safety is of the first importance in the performance of your duties. ⚓

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National Fishing Week, June 2-8, 1986

Saying that all too often the fishing industry and fishermen are forgotten in the United States, Walter B. Jones (D-NC), Chairman of the House Merchant Marine and Fisheries Committee, introduced House Joint Resolution 433 proclaiming June 2-8, 1986, as "National Fishing Week."

"Fishing is a tradition deeply rooted in American history," Congressman Jones said. "From the settlers' time to the present day, fishing has provided an immediate and steady food supply as well as a relaxing form of recreation — only the methods and techniques have changed."

"More than 2,000 U.S. commercial fishermen ply the oceans to satisfy this country's growing taste for seafood. Another 54 million American sport fishermen take to the water for the sheer fun of it. The tackle manufacturers, boat and motor producers, and service industries necessary to support sport and commercial fishing employ nearly 1 million Americans and generate over $27 billion in economic activity," Congressman Jones explained.

"Our fisheries are one of this nation's most important renewable natural resources. Dependence on fisheries for either livelihood or sport promotes respect for both the resource itself and the health of the environment necessary for fisheries to flourish," Mr. Jones continued.

"National Fishing Week will accord recognition to those millions of Americans who fish, whether as family-oriented outdoor recreation or as commercial fishing on the high seas. Each contributes to a healthier and stronger America," Chairman Jones concluded.

CO_2 Requirements for RO/RO Fire Protection

Dr. W.H. McLain
Senior Fire Protection Engineer
U.S. Coast Guard Research and Development Center

Carbon dioxide (CO_2) extinguishes fires by reducing the amount of oxygen in the air. Without enough oxygen, fires cannot burn. CO_2 is also highly effective against flammable liquid fires. U.S. Coast Guard regulations[1] state that either a CO_2 fire extinguishing system or an equally effective system for roll-on/roll-off (RO/RO) cargo spaces be aboard RO/RO ships.

How Much and How Fast?

Regulations of the 1974 International Convention for the Safety of Life at Sea (SOLAS)[2] state that an acceptable CO_2 extinguishing system should deliver 66-2/3 percent of its total required quantity in 10 minutes. However, Coast Guard regulations stated that the system must deliver 100 percent of its required quantity in 2 minutes. (Total required quantities for both systems are the same.) During reflaggings, vessels built to conform with SOLAS requirements had to be modified to meet the stricter Coast Guard guidelines, which meant substantial costs to ship owners.

To determine the relative effectiveness of its requirements, the Coast Guard developed an experimental program of fire tests to evaluate CO_2 application rates aboard RO/RO vessels.[2] The tests were conducted in a cargo hold of a Coast Guard test vessel, the MAYO LYKES, which had been modified to simulate a RO/RO automobile carrier. This test ship, located in Mobile, Alabama, is part of the Coast Guard's Fire and Safety Test Detachment, the only full-scale marine fire testing facility in the world.

The Test

We decided to conduct the test as though fuel had been spilled from a ruptured automobile tank or a portable gasoline container. Ship operators told us that automobile tanks usually contain less than 2 gallons of fuel, but we observed that 5-gallon portable containers were commonly carried in the cargo area to refuel the cars. Therefore, we set the scenario of a 5-gallon spill fire to simulate a "typical" Class B fire. Both gasoline and mineral spirits were used as test fuels. Pans of fuel were placed directly under the gas tank to simulate the most probable spill. (Tanks were carefully emptied and vented before the tests to prevent explosions.) The test consisted of a Class B fire (flammable liquid) complicated by tires, upholstery, and other flammable components.

We placed 18 automobiles in the No. 3 hold of the MAYO LYKES. The vehicles were located on the second deck, which had been partitioned with a steel bulkhead. Hatches on the No. 3 hold were in place but not sealed. The test area had a total volume of 37,470 cubic feet and a length of 55 feet.

The cars were installed in a 3-by-6 array with only 1 or 2 feet between bumpers. The close spacing simulated actual shipboard conditions and was deliberately done to measure how the fire would spread in a tightly packed group. Further, as a "worst-case scenario," we assumed that two adjacent spills might occur at the same time. Therefore, all tests used two pan fires under adjacent cars. In this way, we could also determine the effect of one fire on another.

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[1] *46 CFR, 76.05-1(a), 76.15-5f, 95.05-10(b)(4), 95.15-5(f),*

[2] *International Convention for the Safety of Life at Sea, 1974, as amended, Reg. II-2/53.2.2.1*

The test program consisted of 12 fire tests. Four of these tests were conducted using a false overhead about 6 feet above deck. Eight tests were conducted without the false overhead. The CO_2 discharge nozzles were positioned approximately 1 foot under the main deck for all tests.

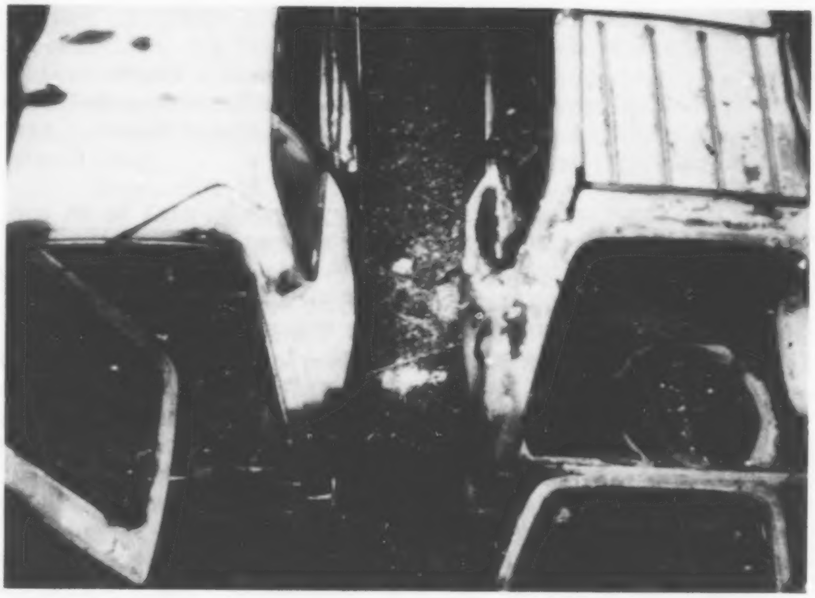
In all our pan tests, the fire was extinguished before it spread to the automobile interiors. To simulate a severe fire, gasoline was poured into the passenger compartments of two cars, thoroughly soaking the upholstery. In this case, the CO_2 system designed to the SOLAS standard extinguished both the Class A and Class B fires, and the fire did not spread to adjacent cars.

Test Results

Data was obtained for the following variables:

- Percent of oxygen at selected locations.
- Percent of CO_2 at selected locations.
- Extinguishment time.
- Time-temperature above the fuel pans.
- Weight of CO_2 applied.
- Quantity of fuel burned.

Using this data, a number of parameters were evaluated. The most important parameter was the number of extinguishments, i.e., how many times the fire was put out before the fuel was entirely consumed. Our results showed that the pan/automobile fires were extinguished by CO_2 in all tests. The next most important parameter was the amount of CO_2 needed to extinguish the fire. To quantitatively measure the amount of CO_2 applied, we constructed a special scale which could accurately (± 10 lbs.) weigh the low-pressure



Post-test views of automobiles used on roll-on/roll-off ship fire tests. (Photos courtesy of the author) tank and its contents (up to 26,000 lbs). The successful amount of CO_2 used for each test was between 1,100 and 1,600 lbs.

Why were the fires extinguished? In a system consisting of gasoline, CO_2, and air, gasoline will not burn if the oxygen concentration is below 14.4 percent. This corresponds to an atmosphere containing approximately 28 percent CO_2. We measured oxygen levels with sensors located 10 inches above deck, and our data verified that the fire was extinguished when the oxygen level was reduced to less than 15 percent.

On the basis of our test results, we drew the following conclusions:

- The application rates prescribed by both SOLAS and the Coast Guard are sufficient to extinguish anticipated gasoline-spill and automobile fires on a RO/RO ship.

- Class B spill fires on an automobile transport ship can be extinguished by CO_2 applied in the quantity and at the application rate specified in the SOLAS regulations.

- The flow of CO_2 to lower levels was not significantly impeded by the simulated two-deck construction.

As a result of these conclusions, Coast Guard regulations were recently modified to align them with the SOLAS requirements.[3] This change will significantly lower the costs involved in reflagging RO/RO ships but will not compromise shipboard fire safety. In this instance, the Coast Guard's unique Fire and Safety Test Detachment provided relevant engineering data to help modify regulations for the maritime industry. ⚓

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[3] *Federal Register, 22 August 1985, Vol. 50, No. 77, pp. 15750-15751*

Lessons from Casualties

Donald J. Kerlin
Marine Technical and Hazardous Materials Division
U.S. Coast Guard

While the foreign-flag passenger vessel M/V OCEANIC was undergoing rehab work alongside the pier at Port Canaveral, Florida, it suffered a fire within the accommodation area. Through some excellent preplanning, the outbreak was contained to a very small fire.

A 440-volt shore tie was run through a porthole to provide electrical power to the vessel while the vessel was undergoing repair. The movement of the vessel chafed the shore tie, causing the insulation to wear through and causing a short which ignited the combustible materials near the porthole (curtains, etc.). The fire spread throughout the originating stateroom, completely gutting the room. Some heat damage occurred to an adjacent compartment through a common bulkhead. Also, some smoke damage occurred within the area of the gutted stateroom. The fire was contained to the room of origin.

The vessel's crew responded rapidly to the blaze, and within 30 minutes, the fire was under control. In addition to the crew responding rapidly, the port fire authorities and the Coast Guard also responded.

Much of the rapid response can be attributed to an excellent preplanning document between the port authority, the Coast Guard, and the various vessels that call at the port. As a result of the S.S. SCANDINAVIAN SEA fire in 1984, the port fire contingency plan was rewritten to provide a better, more resposive plan. For all who participated in the M/V OCEANIC fire, the new plan was a great success. All appropriate personnel were notified, and all notifications were done in a timely manner. Had the vessel's crew been unsuccessful in combating the fire, the port authority fire brigade and the Coast Guard were on scene ready for action.

This casualty dramatically demonstrates two important facts:

1. A vessel with proper structural fire protection, built to the highest international fire safety standards, will contain a fire to its place of origin for a specified time period.

2. There is no substitute for proper fire/emergency preplanning.

continued on page 84

Search and Rescue at Sea -- Part 2

On June 22, 1985, the International Convention on Maritime Search and Rescue entered into force. It is an indication of the Convention's importance and the subject itself that the theme of last year's World Maritime Day (celebrated by IMO on September 26, 1985) was maritime search and rescue.

In the last issue of ***Proceedings****, a special article dealt with the background to search and rescue at sea. In this issue we look at the SAR Convention itself.*

Search and Rescue Operations

The obligation of ships to respond to distress mesages and signals from other ships is one of the oldest traditions of the sea. It is also enshrined in various international conventions. One of them is the Brussels Convention on Assistance and Salvage of 1910.

Article 11 of that convention established in international law the tradition of the brotherhood of the sea. It stated that "every master is bound, so far as he can do without serious danger to his vessel, her crew, and her passengers, to render assistance to everybody, even though an enemy, found at sea in danger of being lost." The convention also required Contracting Parties to adopt national laws or regulations to give effect to this provision.

The obligation to provide assistance to persons in distress at sea had been embodied in other international conventions, particularly the International Conventions for the Safety of Life at Sea and the Convention on the High Seas (1958).

Regulation 10 of Chapter V of SOLAS 1974 states, "The master of a ship at sea, on receiving a signal from any source that a ship or aircraft or survival craft thereof is in distress, is bound to proceed with all speed to the assistance of the persons in distress, informing them if possible that he is doing so..."

The regulation goes on to outline various other obligations with regard to rescue operations, and in Regulation 15 the SOLAS Convention gives basic requirements for Governments regarding search and rescue operations.

It says, "Each Contracting Government undertakes to ensure that any necessary arrangements are made for coast watching and for the rescue of persons in distress at sea round its coasts. These arrangements should include the establishment, operation, and maintenance of such maritime safety facilities as are deemed practicable and necessary regarding the density of seagoing traffic and the navigational dangers and should, so far as possible, afford adequate means of locating and rescuing such persons."

In addition, "Each Contracting Government undertakes to make available information concerning its existing rescue facilities and the plans for changes therein, if any."

These international instruments operate without prejudice to each other, and the repetition of the same principle in more than one convention does not introduce any inconsistencies but strengthens the legal obligations which give added force to tradition.

When IMO was established in 1959, its first major action was to convene an International Conference on the Safety of Life at Sea. This met in 1960 and adopted a new version of the SOLAS Convention. It also adopted a number of recommendations which requested IMO to take appropriate action to improve search and rescue at sea. These included the following:

Contracting Governments should establish coast radio stations to keep a continuous listening watch on the radio-

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This article was originally published in the No. 3, 1985, issue of the ***IMO News****.*

telegraph and radiotelephone distress frequencies and on frequencies used by survival craft.

Joint studies by IMO, the International Civil Aviation Organization (ICAO), the International Telecommunication Union (ITU), and the World Meteorological Organization (WMO) should be undertaken on matters regarding the planning and provision of facilities for search and rescue.

Urgent consideration should be given by IMO, ICAO, ITU, and WMO on the best way of establishing communications between aircraft and ships involved in cases of distress.

Contracting Governments should encourage all ships to participate in merchant ship position reporting systems established for search and rescue. These systems should be free of cost to user ships.

Governments should encourage ships to fit emergency position-indicating radio beacons (EPIRBs) where appropriate.

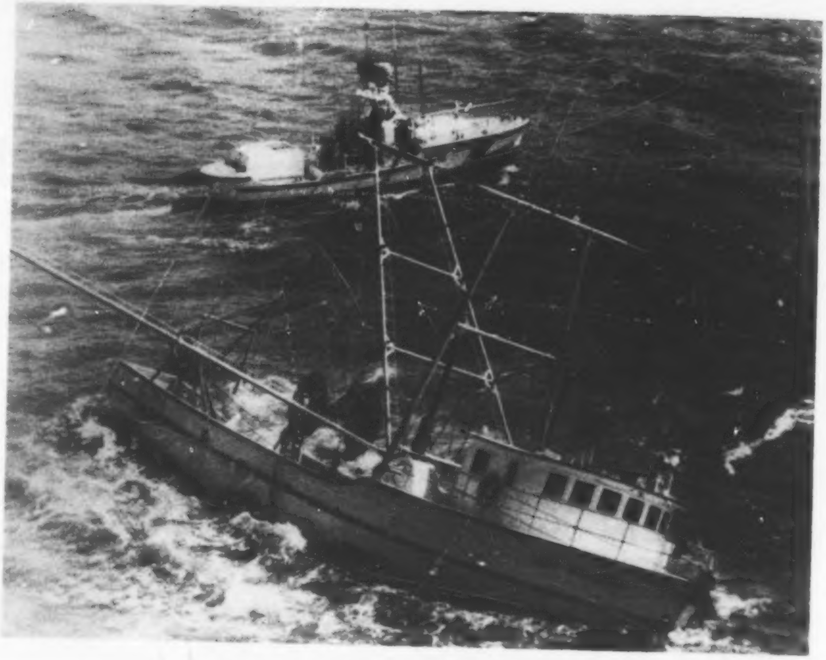
These recommendations provided the basis for IMO work in this area during the next few years, but many delegations felt that more needed to be done to improve and to standardize search and rescue organizations.

It was recognized that IMO had a crucial role to play both in providing advice and guidance and also in formulating an international search and rescue plan.

As a first step, a manual on search and rescue operations was prepared for the guidance of those requiring assistance at sea or who find themselves in a position to provide assistance to others. The draft was completed by 1969 and was finally adopted by the IMO Assembly in 1971 under the title of the **Merchant Ship Search and Rescue Manual (MERSAR).**

The MERSAR manual is primarily designed to aid the master of any vessel who might be called upon to conduct search and rescue (SAR) operations at sea. It is divided into eight chapters which deal with SAR coordination, action by a ship in distress, acting by assisting ships, assistance by SAR aircraft, planning and conducting the search, conclusion of search, communications, and aircraft casualties at sea.

Although the MERSAR manual provides valuable guidance, it was always envisioned that international search and rescue requirements should be established. The Assembly resolution which adopted the manual notes "with approval that the Maritime Safety Committee (MSC) has included in its long-term work program the formulation of an international agreement on a search and rescue system." It then goes on to request the MSC to consider "in due course the status of the Manual in the context of the agreement on a search and rescue system."



The Coast Guard stands by while monitoring the condition of the fishing vessel LADY BARBARA. (Official U.S. Coast Guard photo)

The International Convention on Maritime Search and Rescue, 1979

Based on the recommendations of a Search and Rescue Seminar held by the United States in October 1970, the Maritime Safety Committee established a Group of Experts on Search and Rescue which was instructed to prepare a draft International Convention on Maritime Search and Rescue. It also prepared a second manual called the **IMO Search and**

Rescue Manual (IMOSAR) which was adopted by the Maritime Safety Committee in 1978.

The manual provides guidelines rather than requirements for a common maritime search and rescue policy, encouraging all coastal states to develop their organizations on similar lines and enabling adjacent states to cooperate and provide mutual assistance.

Taking into account that maritime and aeronautical search and rescue organizations are complementary, the Manual has been aligned as closely as possible with the International Civil Aviation Organization (ICAO) Search and Rescue Manual to ensure a common policy and to facilitate consultation of the two Manuals for administrative or operational reasons.

The material has been arranged into two parts:

Part 1, **the search and rescue organization**, deals with matters pertaining to states, regarding the organization of existing services and facilities and the establishment of additional services and facilities necessary to provide practical and economical search and rescue coverage of a given area.

Part 2, **search and rescue procedures**, contains material to assist all personnel who will participate in search and rescue operations and exercises.

Appended to the Manual is a Maritime Search and Rescue Recognition Code which is intended to facilitate the communication of essential descriptive information regarding merchant vessels and small craft within and between maritime SAR organizations.

The Group of Experts also prepared a draft of the proposed SAR Convention which was adopted at a conference held in Hamburg in 1979. It entered into force on June 22, 1985, and is expected to remedy a number of weaknesses in the current SAR system.

Coordination and control of search and rescue operations is at present organized by each individual country in accordance with its own requirements and as dictated by its own resources. As a result, national organizational plans have developed along different lines. The dissimilarity of such plans and lack of agreed and standardized procedures on a worldwide basis may give rise to difficulties, particularly at the initial stages of alert. In some cases this results in an uneconomical use of search and rescue facilities or in unnecessary duplication of effort.

However, in some geographical regions, neighboring countries have established regional arrangements which operate successfully, have agreed on links of communications, and have accepted standard procedures and areas of responsibility for coordination and control in cases of distress. Exchange of personnel and frequent contacts between those responsible for operating the search and rescue services help to resolve operational difficulties which might arise and contribute to the effectiveness of the regional system.

The technical provisions of the convention are contained in an annex consisting of six chapters, the first of which deals with terms and definitions. The other chapters are as follows:

Chapter 2: Organization

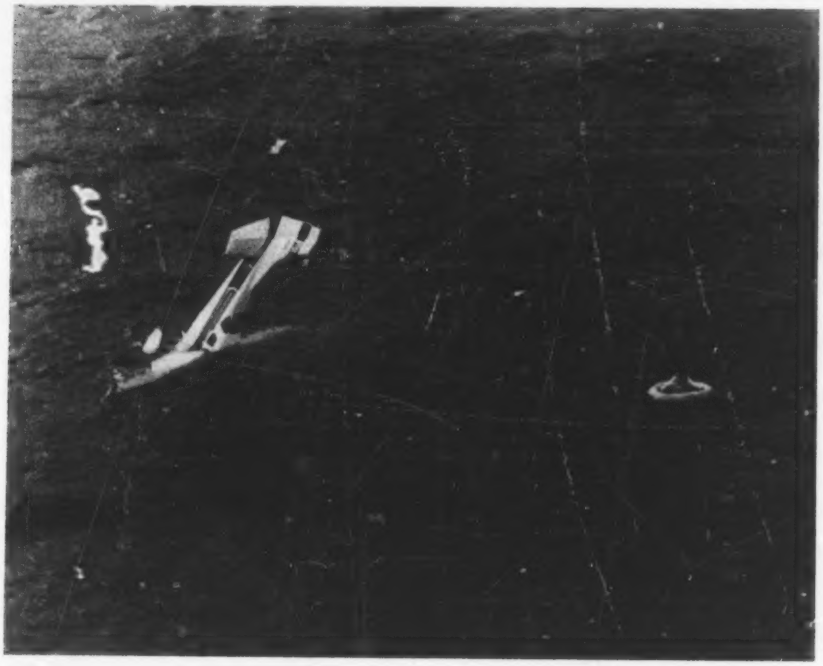
This deals with the basic structure of a search and rescue organization. Parties are required to ensure that necessary arrangements are made for the provision of adequate search and rescue services for persons in distress at sea around their coasts.

A similar (but more extensive) requirement is contained in Regulation 15, Chapter V of the International Convention for the Safety of Life at Sea, 1960 and 1974. The same paragraph of the SOLAS Convention also requires that each search and rescue region shall be established by agreement among the Parties concerned. However, it is recognized in the SAR Convention that it will not always be possible for all Parties to reach agreement, in which case they shall use their best endeavors to reach agreement on appropriate arrangements which would provide equivalent overall coordination of search and rescue services.

To facilitate agreement on the dimensions of search and rescue regions, the convention stipulates that the delimitation of such regions is not related to and shall not prejudice the delimitation of any boundary between states.

Parties should arrange that their SAR services can and do give prompt response to any distress call and must take urgent steps to provide the most appropriate assistance to any person in distress.

Information concerning SAR services must be submitted to IMO and then circulated to all Parties. Parties are required to coordinate their SAR facilities and services nationally by establishing rescue coordination centers (RCCs) and rescue subcenters (RSCs). They must also ensure that each RCC and RSC has adequate means for receiving distress communication and communicating with its rescue



Emergency position-indicating radio beacons (EPIRBs) will guide SAR vessels to the location of a casualty when radio contact is lost. (Official U.S. Coast Guard photo)

units and with RCCs and RSCs in adjacent areas.

Parties are required to designate state services as rescue units. Each rescue unit **must** be provided with appropriate facilities and equipment and **should** have a rapid and reliable means of communication with other units engaged in the same operation.

The chapter concluded with details of color coding and other information to be used on containers and packages of survival equipment for dropping to survivors.

Chapter 3: Cooperation

In addition to requiring Parties to coordinate their own search and rescue organization, this chapter also recommends that they coordinate search and rescue operations with those of neighboring states.

The convention **recommends** that, subject to applicable national legislation, authorization should be given for the immediate entry into or over its territorial sea or territory of rescue units of other Parties which are engaged in a search and rescue operation. It **requires** that search and rescue operations in such cases shall, as far as is practicable, be coordinated by the appropriate RCC or RSC of the party which has authorized entry.

A Party which wishes its rescue units to enter into or over the territory of another Party solely for search and rescue purposes shall send a request to the RCC or other designated authority of that Party. This request must give full details of the intended mission and the need for it. The Party receiving such a request must immediately acknowledge it and, as soon as possible, state any conditions under which the intended mission may be undertaken. However, to prevent unnecessary delays and formalities, Parties are recommended to enter into agreements with neighboring states on the conditions for entry of their rescue units into or over their respective territorial sea or territory.

The convention also recommends that each party should authorize its RCCs to

- request and provide such assistance as may be needed from or by other RCCS;
- grant any necessary permission for the entry of SAR units into or over its territorial sea or territory and to make the necessary arrangements with customs, immigration, and other authorities.

Agreements with neighboring states are also recommended for the pooling of facilities, the establishment of common procedures, the conduct of joint training and exercises, regular checks of interstate communications, liaison visits by RCC personnel, and exchange of search and rescue information.

Aircraft play a crucial role in SAR operations today, and the convention recognizes the importance of this aspect by requiring Parties to ensure the closest practical coordination between maritime and aeronautical services. Where practicable, joint RCCs and RSCs should be established to serve both maritime and aeronautical purposes. However, if separate RCCs or RSCs are established to serve the same area, the closest practical coordination must be ensured, and common procedures must, as far as possible, be established for maritime and aeronautical purposes.

Chapter 4: Preparatory Measures

This chapter deals with the preparatory measures to be taken by RCCs and RSCs and the state of preparedness of rescue units.

Each RCC and RSC must have available up-to-date information relating to its area, including details of available rescue units and coast watching units; its resources, such as transportation facilities and fuel supplies; means of communication, including names, cable and telex addresses; telephone and telex numbers of shipping agents, consular authorities, international organizations, and other agencies that may be able to assist in obtaining vital information on vessels; identities of maritime mobile service and other radio stations; and other information.

Each RCC and RSC should have ready access to all appropriate information concerning the vessels within its area which may be able to provide assistance to vessels or persons in distress at sea. Each RCC and RSC must have detailed plans or instructions for the conduct of search and rescue operations in its area. These should contain details concerning action to be taken by those engaged in SAR operations in the area. The chapter goes on to list those details which should be covered.

Chapter 5: Operating Procedures

Parties are required to ensure that continuous radio watches are maintained on international distress frequencies when this is considered practicable and necessary. Detailed requirements are given concerning the actions to be taken by coast radio stations which receive distress messages.

Any element of the search and rescue organization which has reason to believe that a ship is in a state of emergency should, as soon as possible, give all available information to the approporiate RCC or RSC. These in turn must evaluate this information and determine the emergency phase and the extent of search and rescue operation required.

For operational purposes, there are three emergency phases:

1. The **uncertainty phase**, when a vessel is overdue or has failed to make an expected position or safety report.

2. The **alert phase**, when attempts to contact the vessel and other inquiries have been unsuccessful or when information is received that the operating efficiency of the vessel is impaired but a distress situation is unlikely.

3. The **distress phase**, when positive information is received that a vessel or a person is in need of immediate assistance; or when further attempts to establish contact with the vessel have failed, and it appears likely that the vessel is in distress; or that the vessel's operating efficiency has been impaired to the extent that a distress situation is likely.

The chapter gives details of the procedure which must be followed in each of these phases.

Procedures are also outlined for the initiation of SAR operation for vessels whose position is unknown.

The chapter then deals with a number of other operational matters, including coordination when two or more Parties are involved; termination and suspension of SAR operations; on-scene coordination of SAR activities; designation of the on-scene commander and his responsibilities; designation of the coordinator for surface search and his responsibilities; and initial action and searches.

Chapter 6: Ship Reporting Systems

In view of the importance of ship reporting systems for search and rescue operations, the conference decided to include a chapter on this subject in the convention.

However, it would not be practical or necessary for each Party to establish such a system, and the provisions of this chapter are therefore only of a recommendatory nature.

The convention says that Parties should establish a ship reporting system within any search and rescue region for which they are responsible, where this is considered necessary and practicable for search and rescue purposes. Parties wishing to do so should take account of relevant IMO recommendations.

A ship reporting system should provide up-to-date information on the movements of vessels. During a distress incident, this could reduce the interval between loss of contact with a vessel and the initiation of search and rescue operations, permit rapid selection of vessels which are in a position to assist, limit the search area, and facilitate the provision of medical assistance or advice.

To achieve the above objectives, the ship reporting system should provide information which would make it possible to predict vessel movements, including sailing plans and position reports; maintain a shipping plot, receive periodic reports of participating vessels; be simple in design and operation; and use an internationally agreed standard ship reporting format and procedures.

A ship reporting system should incorporate the following reports, each containing the name and call sign or ship station identity:

- the sailing plan, giving the date, time, and point of departure, next port of call, intended route, speed, and expected date and time of arrival;
- the position report, with date, time, position, course, and speed; and
- the final report, giving date and time of arrival at destination or of leaving the area covered by the system.

Parties should encourage all vessels to participate in such ship reporting systems and should pass information on the position of vessels whenever requested for search and rescue purposes. To assist in establishing ship reporting systems, a resolution establishing general principles for them was adopted by the IMO Assembly in 1983.

The SAR conference also adopted eight resolutions as follows:

Arrangements for provision and coordination of SAR services. States are urged to coordinate all SAR services including those for aeronautical purposes. IMO is invited to continue to work closely with ICAO to harmonize aeronautical and maritime SAR plans and procedures.

Coast Guard personnel attempt to recover a pleasure boat just off the New York shore. (Official U.S. Coast Guard photo)

Cost to ships of participating in ship reporting systems. States are recommended to arrange for participation in such systems to be cost-free to the ships concerned.

Need for an internationally agreed format and procedure for ship reporting systems. The resolution invites IMO to develop an internationally agreed format for ship reporting systems using as a basis a format annexed to the resolution. Such a format was adopted by the 13th Assembly of IMO in November 1983 by Resolution A.531(13).

Search and rescue manuals. The resolution encourages the use of the MERSAR and IMOSAR manuals.

Frequencies for maritime search and rescue. The resolution urges the allocation of one frequency for use exclusively for distress and safety purposes in the 4, 6, 8, 12, and 16 MHz maritime mobile bands.

Development of a global maritime distress and safety system. IMO is invited to develop a global maritime telecommunications system for distress and safety purposes which will support the SAR plan prescribed in the convention.

Harmonization of SAR services with maritime meteorological services. IMO is invited to work closely with the World Meteorological Organization to explore the practicability of harmonizing the areas of maritime meteorological forecasts and warnings with SAR regions.

Promotion of technical cooperation. States are urged, in consultation with, and with the assistance of IMO, to support states requiring technical assistance for training personnel in SAR and for the acquisition of SAR equipment and the development of SAR facilities.

The Present Position

The entry into force of

the SAR Convention does not mean that a worldwide search and rescue system has immediately come into operation. The Convention does not provide a time schedule and does not stipulate any date on which the system should become operative. What it does is to describe the way in which an international SAR system and its component SAR areas should be established.

The world's oceans have been divided into 13 areas for search and rescue purposes, and in most of them, one or more countries have been designated to collect SAR information. The areas, collectors, and current status are shown in table 1.

It can be seen from this table that considerable progress has been made in virtually every region, with search and rescue plans already complete in a number of areas (particularly those where maritime traffic is greater than average). In some of these areas, plans have been drawn up by the countries in the region concerned, but IMO has played a significant part in developing plans in a number of areas.

In 1981 IMO, in coordination with the Economic Commission for Latin America, initiated a project to improve search and rescue services in the Caribbean. It began with a seminar held in Barbados in 1981 and was completed in April 1984 when delegates from 26 countries met in Caracas, Venezuela, and adopted a provisional maritime SAR plan for the Greater Caribbean Area.

IMO is also assisting countries in the Asia and Pacific region. A seminar and workshop held at Jakarta, Indonesia, in October 1984 considered various aspects of SAR

TABLE 1

		ANNEX Status	
	Area and Collector of Information	Collection of Information	Provision of SAR Plans
1	North Atlantic (USA)	Substantially Complete	Substantially Complete
2	North Sea (UK)	Complete	Complete
3	Baltic Sea (Sweden)	Complete	Substantially Complete
4	Eastern South Atlantic (—)	Incomplete	None
5	Western South Atlantic (Argentina and Brazil)	Substantially Complete	None
6	Eastern North Pacific (USA)	Substantially Complete	Substantially Complete
7	Western North Pacific (Japan)	Substantially Complete	Progressed at Workshop in Jakarta, Indonesia, in October 1984
8	Eastern South Pacific (Chile)	Substantially Complete	None
9	Western South Pacific (New Zealand)	Incomplete	Progressed at Workshop in Jakarta, Indonesia, in October 1984
10	Indian Ocean (Australia)	Incomplete	Progressed at Workshop in Jakarta, Indonesia, in October 1984
11	Caribbean (—)	Substantially Complete	Substantially Complete
12a	Mediterranean (France)	Incomplete	None
12b	Black Sea (—)	Substantially Complete	None
13	Arctic Ocean	Complete	None

and prepared a draft provisional maritime SAR plan for the Asia and Pacific region. One of the resolutions adopted invited Governments to review a draft provisional maritime SAR plan which covers the Western North Pacific, Western South Pacific, and Indian Ocean SAR region, which will be finalized at a Final Regional Meeting in 1986.

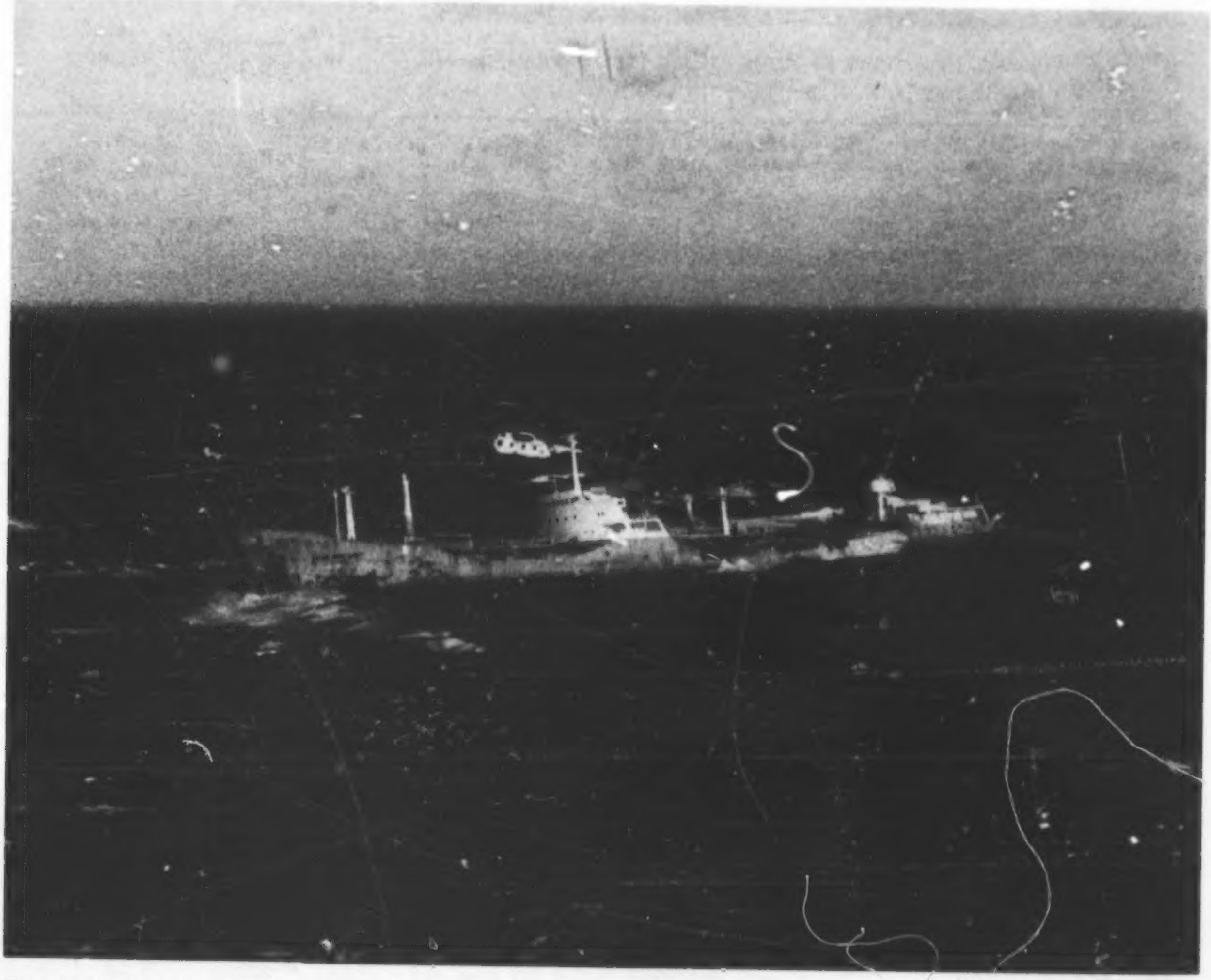
Conclusion

This article has described some of the steps IMO has taken to improve the prospects of survival of those who are involved in maritime casualties. The entry into force of the SAR Convention is another major contribution, and it will become increasingly important in the years to come as more and more countries ratify it and put its requirements into effect.

In the early 1990s, the Future Global Maritime Distress and Safety System will also be instituted (although some of its provisions might come into operation before that date). This will represent another major contribution to maritime safety by improving communications and reducing the delays in receiving distress messages and initiating rescue operations.

These IMO initiatives have received universal support from Member Governments of the Organization and other international and national bodies involved in SAR activities. This has also led to improvements in SAR operations in many areas, and the process is likely to continue in the years to come.

For the first time, the international maritime community has a common basis for SAR operations in the SAR Convention, and the technological advances now taking place in communications and other key areas offer tremendous opportunities for shipping in the future. ‡



The SS ARGO MERCHANT sank in international waters in 1976. (Official U.S. Coast Guard photo)

A U.S. Coast Guard Safety Advisory

Watertight Doors -- Open or Closed?

On the evening of December 12, 1985, the river steamboat MISSISSIPPI QUEEN was involved in an accident about 70 miles up river from New Orleans. In the accident, the machinery space was holed, and it flooded within less than 10 minutes. At the time, 405 persons were on board. The MISSISSIPPI QUEEN is designed to withstand the flooding of a single compartment, but the machinery space is connected to an adjacent refrigeration machinery space by a watertight door. The preliminary investigation indicates this door was open at the time of the casualty. Fortunately, it was closed quickly by a crew member.

The MISSISSIPPI QUEEN made it to shore, and no lives were lost. However, if the single compartment damage had been greater, and if the flooding had been quicker, the crew member might have had to abandon his efforts to close the door. This could have caused the MISSISSIPPI QUEEN to sink within a very few minutes as in the case of the EUROPEAN GATEWAY's sinking. The EUROPEAN GATEWAY was a roll-on/roll-off vessel which flooded and sank off the coast of England several years ago because several of its watertight doors were open.

Since the original Safety of Life at Sea (SOLAS) Convention in 1929, many requirements have been adopted for passenger ships to remain afloat after flooding portions of the internal volume. Internal flooding is limited by requiring internal watertight barriers. The idea of openings in such barriers has been only reluctantly permitted by these coventions and other international agreements. All such openings must be provided with watertight doors. If they are not closed when an accident occurs, installing **watertight** doors is useless, and the ship and its passengers are unprotected.

During the past few years, several ships with watertight doors left open for easier ship operation have flooded. Some of these vessels sank, and some were saved by beaching. These casualties occurred worldwide. The International Maritime Organization is currently discussing a better international agreement on whether these doors should remain closed or whether there are certain instances in which these doors may remain open if fitted with bridge-controlled doors. Several alternatives are being discussed.

In North America, several instances of close calls because of open watertight doors have occurred recently. In addition to the MISSISSIPPI QUEEN discussed above, a small passenger vessel, SUNDANCER, traversing the west coast of Canada with overnight passengers, struck a rock. The bridge watch activated the automatic door-closing mechanisms, and all doors closed — except for one. This door operated, but it did not close completely. Investigators theorized that the door was jammed open by a piece of floating debris. Fortunately, the vessel was quickly beached, and there were no severe injuries. Open watertight doors also significantly contributed to the sinking of the tug MORTON S. BOUCHARD, JR. and the offshore supply vessel LAVERNE HEBERT.

The U.S. Coast Guard reminds all persons in the maritime industry that the watertight-boundary concept of limiting flooding is dependent on doors that remain closed at all times except when in actual use. It was to this end that the regulatory wording regarding watertight doors has remained conservative, cautioning designers to provide a "minimum" of openings and cautioning operators to keep the doors closed while the ship is not secured to a pier.

The wording of 46 CFR 78.15 is repeated here for emphasis:

78.15 — Doors Closed at Sea
(a) All watertight doors in subdivision bulkheads shall be ***kept closed during navigation*** *except when necessarily opened for working of the vessel, . . .*

Note: "Opened for working" does not include routinely left open and then closed in an emergency. It means normally closed, opened only when specifically necessary, and then immediately closed as soon as each pass-through is completed.

Patrick S. Gardella

Pyridine

Pyridine is the parent of a series of compounds important in medicinal, agricultural, and industrial chemistry. The main use for the pure chemical is as a solvent. In the past, pyridine was used mainly as an antiseptic and as a treatment for asthma, but this practice ended when the chemical's harmful effects to humans became known.

Pyridine is normally a slightly yellow or colorless liquid, and its main characteristic is its disagreeable odor. Pyridine can be detected by smell in a quantity as small as 0.012 parts per million. It may also be identified by its very sharp taste, although this test is **not** recommended. Almost all simple pyridine compounds are basic, as is pure pyridine. Pyridine is not found naturally in its pure state and must be isolated from coal or coal tar.

Pyridine is generally shipped in its liquid form, and the most common means of transportation is by multimodal tank transport. It is also shipped in drums and in bulk on parcel tankers. Since pyridine is an excellent solvent, this aspect should be considered when gaskets, O-rings, and other sealants will be in contact with the liquid. Usually, PTFE (polytetrafluoroethylene, Teflon), graphite, and asbestos-based gaskets are used.

In its pure form, pyridine is highly reactive. It will react violently with nitrogen tetroxide (N_2O_4) and will incandesce when contacted with fluorine. It may be combined with other chemicals to form literally thousands of compounds. It is miscible in all proportions in water but is volatile in steam.

When pyridine vapor is inhaled, it will cause respiratory irritation and may cause headache, nausea, giddiness, and vomiting. It has caused conjunctivitis when in contact with the eyes. Dermatitis has resulted from skin contact. If the liquid is taken by mouth, it affects the central nervous system, and if large enough doses are taken, it will act as a heart poison. Death has occurred in laboratory rats when doses of 4,000 parts per million per hour are inhaled or when 891 mg/kg of body weight is taken orally.

First aid for accidental exposure follows standard procedures. For skin contact, the contaminated areas should be rinsed with large quantities of water. For eye contact, the eyes should be flushed with water continuously for 15 minutes. In cases of ingestion, contact the Poison Control Center as quickly as possible for directions. If this is impossible or impractical, you should induce vomiting in a conscious victim. (Unconscious victims should never be made to vomit.) The victim should be brought into fresh air and given artificial respiration or oxygen, if necessary. As with all poisonings, seek medical attention immediately.

Pyridine fires should be extinguished with alcohol foam, dry chemicals, or CO_2. Steam must not be used to extinguish the fire as it may cause an explosion. To prevent explosions or additional fires, the storage tanks must be kept cool with a constant spray of water. Firefighters should be provided with a self-contained breathing apparatus and gloves.

Care should be exercised in case of accidental leakage. Any leakages or spills should be isolated and shut off. After clearing all personnel from the area, clean-up workers should cover the spill with a sand and soda ash mixture (90-10) or flush the area with plenty of water to dilute the pyridine. This area should be ventilated to evaporate any remaining liquid and to dispel any vapors. Clean-up workers should also be provided with a self-contained breathing apparatus and gloves to prevent unnecessary contact. ⚓

Patrick S. Gardella was a Fourth-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

Chemical name:	Pyridine
Formula:	C_5H_5N
Synonyms:	azabenzene azine NCL-C55301
Physical Properties:	
boiling point:	115.3°C (239°F)
freezing point:	-42°C (-43.6°F)
vapor pressure:	
20°C (68°F)	18 mm/Hg
46°C (115°F)	1.3 psia
Threshold Limit Values (TLV)	
time-weighted average:	5 ppm; 15 mg/m^3
Flammability Limits in Air	
lower flammability limit:	1.8% by vol.
upper flammability limit:	12.4% by vol.
Combustion Properties	
flash point (c.c.):	20°C (68°F)
autoignition temperature:	482°C (900°F)
Densities	
vapor (air=1):	2.72
specific gravity (at 25°C):	0.9780
density (at 20°C):	0.9830
Identifiers	
U.N. Number:	1282
CHRIS Code:	PRD
Cargo compatibility group:	9 (Aromatic Amines)

Hazardous Chemical Guide Out of Stock

In the February 1986 issue of **Proceedings,** we informed our readers that the Hazardous Chemical Data Manual (CHRIS Manual II) was available for purchase through the Government Printing Office. Unfortunately, we were not aware that only a limited number of manuals were printed, and the existing copies were sold out almost immediately.

Problems in the publication process have delayed the next printing of the Manual; however, additional copies should be ready by late May or early June 1986. The **Proceedings** will publish another notice when these copies are available for sale.

We apologize to our readers for this inconvenience.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. In the operation of a marine main propulsion boiler, which end point is likely to be reached first?

A. Moisture carryover
B. Combustion
C. Water circulation
D. Steam flow

Reference: Latham, Introduction to Marine Engineering

2. A boiler brought from full load to partial load will always require

A. larger burner sprayer plates.
B. an increase in the percentage of excess air.
C. a decrease by 25% in the number of operating burners.
D. a smaller burner diffuser.

Reference: Babcock and Wilcox, Steam: Its Generation and Use

3. When renewing sections of pipe in a hydraulic system, the nominal pipe size as denoted on a piping diagram always indicates the

A. actual inside diameter.
B. actual outside diameter.
C. wall thickness.
D. thread size for connections.

Reference: Sperry-Vickers, Industrial Hydraulics Manual 935100-A; NAVPERS 16193-B, Fluid Power

4. A vessel's immediate protection in the event of a broken stern tube is which bulkhead?

A. Aft collision
B. Stern frame
C. After peak
D. Aft machinery space WT

Reference: Baker, Introduction to Steel Shipbuilding; American Bureau of Shipping, Rules for Building and Classing Steel Vessels

5. In a refrigeration system, the heat which normally produces the flash gas at the thermostatic expansion valve comes from

A. the hot gas bypass connection.
B. the portion of liquid refrigerant which does not flash.
C. exposure to the relatively high ambient temperature within the coil.
D. exposure to the relatively high ambient temperature of the space to be cooled.

Reference: NAVPERS 10788, Principles of Naval Engineering

DECK

1. When carrying asphalt, one of the biggest dangers is

A. water in the tanks or pipelines.
B. having the asphalt too hot.
C. explosion of vapors after discharge.
D. having to breathe the fumes.

Reference: Baptist, Tanker Handbook for Deck Officers

2. A 6 x 19 wire rope would be

A. six (6) inches in diameter with nineteen (19) strands.
B. six (6) inches in circumference with nineteen (19) strands.
C. six (6) strands with nineteen (19) wires in each strand.
D. nineteen (19) strands with six (6) wires in each strand.

Reference: American Merchant Seaman's Manual

3. The datum from which the predicted heights of tides are reckoned in the Tide Tables is

A. mean low water.
B. the same as that used for the charts of the locality.
C. the highest possible level.
D. given in table three of the Tide Tables.

Reference: American Practical Navigator

4. Lines drawn through points on the earth having the same atmospheric pressure are known as

A. isothermals.
B. millibars.
C. isobars.
D. seismics.

Reference: Donn, Meteorology

5. The gnomonic chart can be used for which of the following purposes?

I. To determine the great circle course between two points.
II. To measure the great circle distance between two points.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

Reference: American Practical Navigator

ANSWERS

ENGINEER
1-B;2-B;3-D;4-C;5-B
DECK
1-A;2-C;3-B;4-C;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417. ⯁

LESSONS FROM CASUALTIES

continued from page 72

As a result of the SCANDINAVIAN SEA and SCANDINAVIAN SUN casualties, the Coast Guard Captains of the Port are working with local shipping representatives, port authorities, and response organizations to develop emergency response, accountability, and evacuation procedures for passenger vessels using their ports. One immediate result is that the Marine Safety Office in Jacksonville now invites the port authority fire personnel to accompany them when conducting Control Verification examinations. This allows the firefighting personnel to become familiar with the vessel's arrangement under "normal" conditions, as opposed to going aboard a vessel for the first time during a fire. ⯁

Keynotes

Notice of Proposed Rulemaking

CGD 84-069a — Lifesaving Equipment; Immersion Suits — (February 4)

The Coast Guard proposes to revise the specifications for approval of exposure suits. Currently approved exposure suits will be phased out and suits meeting the new standards will be assured of international marketability and acceptance. Comments on this proposal must be received on or before May 5, 1986.

CGD 85-026 — Pollution Prevention;
Implementation of Amendments to
MARPOL 73/8 — (February 7)

The Coast Guard proposes to amend the oil pollution prevention regulations for ships in order to implement the amendments and interpretations to Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) that were adopted at the 20th Session of the Marine Environment Protection Committee (MEPC) of the International Maritime Organization and correct the MARPOL 73/78 implementing the final rulemaking of October 6, 1983. (48 FR 45704) Comments must be received by March 24, 1986. (51 FR 4768)

CGD 79-059 — Offshore Cranes — (February 14)

The Coast Guard is proposing to issue regulations concerning offshore crane design standards and operations on Outer Continental Shelf facilities, on deepwater ports, and on mobile offshore drilling units. These proposals are intended to reduce the degree of hazard associated with crane operations. Comments must be received on or before June 16, 1986. (51 FR 5547)

Supplemental Notice of Proposed Rulemaking

CGD 83-013 — Carriage and the Use of Liquefied and
Non-Liquefied Flammable Gas as Cooking
Fuels on Vessels Carrying Passengers
For Hire — (February 6)

Coast Guard regulations currently prohibit the carriage and use of liquefied and non-liquefied flammable gas as ships' stores on vessels carrying passengers for hire. The Coast Guard published proposed rules in the March 22, 1984, Federal Register (49 FR 10685) which would have removed this prohibition as it pertains to cooking appliances and promulgated standards to govern the design, installation, and testing of cooking appliances using these fuels. The purpose of this supplemental proposed rule is to allow for further comment before publication as a final rule because of the substantive changes made to the initial proposal as a result of the comments received. Comments must be received on or before May 7, 1986.

Withdrawal of Notice of Proposed Rulemaking

CGD 79-160 — Lifesaving Equipment; Line-Throwing
Appliances, Required Equipment on
Merchant Vessels — (February 18)

This rule dealt with the requirements for line-throwing appliances for vessels on other than international voyages. It is being withdrawn because many of its provisions are covered by other rulemaking proposals, and a reevaluation of the remaining provisions revealed inappropriate regulations from a safety standpoint.

Proposed Rule

CGD 79-168	Lifesaving Equipment; Launching	(February 13)

The Coast Guard proposes to adopt specifications for approving liferaft launching devices and automatic disengaging devices. This equipment is often used to lower liferafts from vessels with high freeboard, and its use is required on mobile offshore drilling units and deepwater ports. Most of the standards and tests in these specifications have been applied as guidelines for several years in approving liferaft launching equipment. Comments on this proposal must be received on or before May 14, 1986. (51 FR 5377)

Final Rule

CGD 78-174A	Hybrid PFD Carriage Requirements (Two Documents)	(February 4)

(First document): These rules authorize carriage of hybrid inflatable personal flotation devices (hybrid PFDs) on recreational boats and on Outer Continental Shelf facilities and establish conditions for their use. These rules become effective on August 4, 1986. (Second document): These rules authorize the carriage of commercial hybrid PFDs in place of life preservers on uninspected commercial vessels and as work vests on certain inspected commercial vessels. These rules become effective on March 6, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

Carnegie Hero Medals Awarded Posthumously

Two Carnegie Hero Medals were recently awarded posthumously to Captain William A. Fournier and Seaman Daniel J. Govoni by the Carnegie Hero Fund Commission. The medallions are awarded annually by the commission, citing the heroic actions of one individual to save another's life.

Captain Fournier and Mr. Govoni were awarded the bronze medals for their actions on April 11, 1985, to rescue fellow crew member Richard Lisa, who was trapped in an oxygen-deficient hold of a barge owned by Penobscot Bay Towing Company of Belfast, Maine. Mr. Lisa survived the barge accident, but his two 20-year-old rescuers suffocated and drowned in 2 feet of bilge water in the hold. The men were part of a crew working aboard tugs and barges at the Penobscot Bay Towing Company, a subsidiary of Fournier Marine Corporation.

According to Walter Rutkowski, assistant secretary for the Carnegie Commission, a $2,500 honorarium was presented to the families of Captain Fournier and Mr. Govoni along with their medals. ⚓

Reprinted from the February 1, 1986, issue of ***Maritime Reporter and Engineering News.***

Proceedings *readers from outside the Coast Guard are invited to submit articles for publication in future issues. Articles should deal with maritime safety topics and should be approximately 10 pages (double-spaced) in length. If possible, please submit illustrations or photographs (either black and white or color) with your articles. We cannot accept slides for publication.*

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"Splinter village," located on the USCG Academy grounds, was the site for an early version of the Training and Qualification Program. Story begins on page 91. (Official U.S. Coast Guard photo)

New Directions in Coast Guard Training

CDR R. J. Asaro

The subject of this article is the Training and Qualification Program for Coast Guard marine safety personnel and how the program has responded to the growing complexity of the marine safety field and the shaping forces of law, technology, and diminishing resources.

Historical Background

At Coast Guard Headquarters, two offices have responsibility for what the field and the public see as "marine safety." The Office of Merchant Marine Safety ("M") is responsible for vessel inspection, documentation of vessels, licensing and certification of mariners, the technical aspects of vessel construction and cargo carriage, and the investigation of marine casualties. The Office of Marine Environment and Systems ("W") is responsible for the safety and security of harbors and waterways, the enforcement of environmental law in federal waters, and response to discharges of oil and hazardous materials. The offices complement each other. Field units consisting of Marine Safety Offices (MSOs), the Marine Inspection Offices (MIOs), and Captains of the Port (COTP) are the actual performers of these responsibilities. They inspect the vessels and facilities, monitor the clean-up of oil, and deal directly with the public in a multitude of settings and circumstances.

The Marine Environment and Systems program has its roots in late-19th-century efforts to provide cleaner waterways. Little was accomplished due to inadequate funds and the absence of widespread public concern until the late 1960s and early 1970s. As will be noted later in this article, a series of disasters focused attention on issues concerning the marine environment.

The Commercial Vessel Safety Program began in 1838 with the passage of a law to improve steam vessel safety in navigation. After a number of additional laws and several name changes over many decades, the agency which evolved was called the Bureau of Marine Inspection and Navigation (BMIN).

In an effort to maintain a stable and qualified workforce during World War II, in close liaison with other military services, the BMIN was placed under the Coast Guard. Most inspectors became commissioned or warrant officers, though some remained in civilian status. Following the war, the president determined that military execution of marine inspection responsibilities was in the best interest of the nation, and what had been a temporary measure in 1942 became permanent in 1946. BMIN inspectors mainly came from the ranks of merchant marine officers. They usually remained in a single geographical area for their entire careers, and commercial vessel safety was their only duty. For the most part, their training program consisted of following a more seasoned inspector who recommended to the Officer-in-Charge, Marine Inspection (OCMI) when an inspector was qualified to perform on his own.

There was no formal training program, and each OCMI determined the standards for being "qualified" in his area. Later, as new Coast Guard officers entered this field, entrance parameters changed because these officers primarily came from a Coast Guard background instead of a merchant marine background. They would rotate out of marine inspection into other Coast Guard duties for out-of-specialty tours, and they would leave a geographical area after their tour of duty. This regime required a different method of training.

In the early 1950s, this "different method"

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began as a home-grown course offered by CDR Lynn Parker, Executive Officer of the Reserve Training Center, New London, Connecticut. The physical area in which the course was taught, located on the grounds of the Coast Guard Academy, was called "splinter village" because the buildings were World War II temporary facilities. These temporary buildings served almost 20 years before being demolished.

As older BMIN officers left the service, the marine inspection indoctrination course was offered more frequently and became more formalized. LCDR William M. Benkert was assigned as the first formal school chief in 1953. He was also the first and only instructor. To alleviate that situation, he received assistance from the OCMI, New London, and CDR Fred Arzt, the Senior Investigating Officer in New York, who would travel to New London for the class sections to teach investigations and suspension proceedings. The course expanded to 12 weeks and eventually relocated in 1959, along with the Reserve Training Center, to its present site at Yorktown, Virginia. In the following decade, the course was refined, but it remained basically the same.

However, in the 1970s, a series of significant events dictated the necessity for change to the existing training program:

- The Coast Guard's Office of Marine Environment and Systems was formed in July 1971.
- The Federal Water Pollution Control Act of 1972, the Port and Waterways Safety Act of 1972, the Port and Tanker Safety Act of 1978, and the 1978 Amendments to the Outer Continental Shelf Lands Act of 1953 gave additional authority and responsibility to the Coast Guard in a number of areas of increasing national concern. Further, the Hazardous Materials Transportation Act (1975) expanded the Coast Guard's existing regulatory role in that area.
- A series of major marine disasters in the winter of 1976-77 focused public attention in the United States on the Coast Guard's role in protecting the environment and inspecting vessels for compliance with safety and pollution prevention regulations. The explosion of the SANSINENA in Los Angeles and the grounding of the ARGO MERCHANT off Nantucket, both of which occurred in December 1976, served as catalysts for U.S. initiatives pursuing international agreements under the aegis of the International Maritime Organization (IMO), formerly IMCO. The far greater pollution occasioned by the grounding of the AMOCO CADIZ in March 1978 refocused that attention and galvanized worldwide opinion on the need for international accord.
- "M" and "W" functions were merged at the field level in 1974 to form Marine Safety Offices. (In fact, many smaller units in the 1960s performed combined duties but were not called Marine Safety Offices because the Office of "W" had not been formed at that time.)

BENJAMIN LINCOLN HALL

This graduating class poses on the steps of Lincoln Hall, a barracks building, for its official portrait, and provides quite a contrast to the "splinter village" class on our cover. (Photo provided by LCDR Bob Shilland.)

In response to the sweeping changes in the 1970s, the Marine Safety School in Yorktown developed a new 12-week course including elements of both programs and called it the Marine Safety Basic Indoctrination Course (MSBIC). The background and experience of personnel entering the programs during this period had also changed: very few entry-level inspectors had merchant marine experience, there were practically no remaining BMIN inspectors, and the experience level of field inspectors averaged 4 years or less. In addition, a variety of initiatives were being proposed at the international level designed to make tankships safer and to reduce pollution from vessels. This resulted in a proliferation of regulations containing complex technical provisions.

Reserve Training Center Yorktown, early view prior to new construction. (Official U.S. Coast Guard photo)

In the early 1980s, a new set of problems emerged:

- Coast Guard budget and personnel allowances were being cut.
- Program officials addressed the gradually eroding expertise base. Problems were created by requiring all entry-level officers to learn both the "M" and "W" programs during an initial tour, where formerly the officer was only required to learn one or the other program.

By 1981, these forces necessitated another change in the training philosophy.

Implementing Change

In an effort to reduce costs and to train more effectively and more efficiently, personnel from both the Marine Safety School and the Headquarters Marine Safety Training Staff sought alternatives to the teaching methods that were in place. The solution chosen was Instructional Systems Development (ISD). The basic tenet of this system is to teach only what is needed to perform the immediate job and to teach it only when it would be reinforced soon thereafter on the job (e.g., under the previous system, one learned investigating-officer skills in the basic indoctrination course, but the officer might not perform those functions until 2 years later.)

Beginning in 1981, while continuing to teach a full curriculum, the staff at the Marine Safety School completely rewrote its courses to ISD parameters. The convening of new courses began in October 1984.

ISD formalizes the best elements of older teaching methods, but it also adds several new concepts. The system may be summarized as follows:

1. Need-to-know training.

2. Program management of the learning process.

3. Feedback.

4. Modification of training.

Supplementing these general factors, the Coast Guard program has also implemented three additional elements:

5. **Training ports:** specialized learning centers for commercial vessel safety at Marine Inspection Office, New York, New York; Marine Inspection Office, New Orleans, Louisiana; Marine Safety Office, Puget Sound, Seattle, Washington.

6. **Multidimensional training:** self-paced lesson plans, resident professional technical training, videotapes, on-the-job (OJT) training manuals.

7. **Formal performance evaluation:** qualification requires completion of a formalized training program **and** a final review by a training panel at the unit.

There is no hard-and-fast rule as to how long it takes to become a qualified commercial vessel safety inspector. However, beginning in 1987, the Training Ports will graduate about 35 vessel inspectors annually, enough to meet program depletion through routine attrition. The present training program develops commercial vessel safety inspectors through resident courses, post-graduate training, industry training, videotapes, and OJT. Specialized, non-Coast Guard training is also available in more than 160 areas with the average inspector completing 8 resident courses during a career. Courses address such topics as welding and metallurgy, non-destructive testing, investigation of marine casualties and violations, inspection and operation of various shipboard systems, response to oil and hazardous substance discharges, handling of explosives and bulk hazardous materials, offshore drilling equipment and operations, and occupational safety.

In addition to their teaching and course development duties, the staff of the Marine Safety School also coordinates the learning objectives of the non-Coast Guard resident training to ensure consistency and efficiency throughout the program. With the delegating of certain inspection functions to the American Bureau of Shipping (ABS), the need for consistent regulatory interpretation assumes increased importance. As such, the Bureau has been invited to audit two inspection courses at the Marine Safety School. They have accepted this invitation, with the possibility that certain ABS surveyors may attend all or parts of these courses in the future at ABS expense.

A significant part of the overall ISD training philosophy is the feedback element. Students themselves evaluate the courses. Six months after the course, both the students/trainees and their commands evaulate the field effectiveness of the course. The trainees are also evaluated periodically on the progress of their OJT manuals, and there is a final evaluation upon completion of the OJT manual to determine qualification for a particular skill area.

Conclusion

Training is now more specialized. In the revised system, all training is job-directed: a concentrated effort with mandatory feedback to ensure accuracy and relevance. A first-tour inspector will spend 2 years at a designated training port learning the "inspection" side of the program. After that, the inspector is transferred to a non-training port to develop additional depth of experience. There is no longer a requirement that the marine safety inspector also learn environmental response in the first or second tour. Other trainees in the environmental protection/port safety and security areas will also spend their first tour specializing much in the manner of the Commercial Vessel Safety trainee.

By clearly specifying program goals, determining the most effective and efficient teaching methods, concentrating learning effort in one of two broad areas, and providing frequent performance feedback, the training program now in effect fulfills a longstanding Coast Guard dictum: we are doing more with less, but we are doing it better.

Hamilton Hall, present home of the Marine Safety School at Reserve Training Center, Yorktown. (Official U.S. Coast Guard photo)

The Marine Safety Center

LCDR John E. Veentjer

Initiatives taken by the Coast Guard in the Commercial Vessel Safety (CVS) Program over the past 4 to 5 years have been successful in reducing the manpower intensiveness in this program. In the area of technical plan review, initiatives have shifted some of the workload to third-party organizations, thus reducing former backlogs. In addition, current plan review workload is dispersed geographically to the point where regional offices are no longer warranted. With the continued downturn in shipbuilding, particularly in the United States, and the prospect of ever-reducing budgets, the Coast Guard has decided to reorganize the resources associated with the CVS technical functions. Thus, the regionally based field technical offices are being consolidated in the establishment of a new Headquarters unit, the Marine Safety Center (MSC), during the summer of 1986.

The CVS Program is the longstanding federal program established to promote safety in the design, construction, and operation of commercial vessels. In response to more recent legislation, the CVS Program is also concerned with the design and operation of vessels so as to minimize pollution of our environment. The basic objective of the CVS Program is to minimize deaths, personnel injuries, property loss, and environmental damage associated with the operation of vessels and other facilities engaged in commercial or scientific activity in the marine environment. This objective is pursued through the development and enforcement of federal laws and regulations and the implementation of international agreements.

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Concerns over vessel safety date back to the early 1800s, when the introduction of steam propulsion into ships was accompanied by catastrophic accidents resulting in loss of life, injury, and property loss or damage. Alarmed at the frequency and severity of steamboat boiler explosions, the Congress passed the first federal law for steamboats in 1838. This law set requirements for manning by competent personnel, specified certain firefighting and lifesaving equipment, required vessels to be inspected, and provided for the issuance of certificates of inspection attesting to the steamboat's seaworthiness. Throughout the century to follow, there was additional legislation in reaction to disasters which broadened the scope of the program, improved the program administration, and reassigned the responsibilities. The CVS Program was transferred to the Coast Guard from the Bureau of Marine Inspection and Navigation (BMIN) in 1942 for the duration of World War II. (The Bureau of Marine Inspection and Navigation was formed in 1932 by consolidating the Bureau of Navigation and the Steamboat Inspection Service.) Ultimately the transfer was made permanent. Until 1967, when the Coast Guard was transferred to the Department of Transportation, the CVS Program had been administered within the Treasury Department.

On behalf of the Commandant of the Coast Guard, the Chief, Office of Merchant Marine Safety (G-M), administers the Commercial Vessel Safety Program. G-M is comprised of several divisions, including the Marine Technical and Hazardous Materials Division (G-MTH) which is directly responsible for the administration of the technical functions of the CVS Program. G-MTH is the result of a reorganization which incorporated elements of the former Merchant Marine Technical Division (G-MMT) and the former Cargo and Hazardous

Materials Division (G-MHM). At this same time, several elements of the former G-MMT were moved to the existing Merchant Vessel Inspection Division (G-MVI).

The merchant marine technical functions were established in a 1939 reorganization of the Bureau of Marine Inspection and Navigation on the basis of recommendations of "the Committee on Commerce" investigating the marine casualties involving the MORRO CASTLE and the MOHAWK. Having found the U.S. vessel inspection laws defective in many respects, this Committee, with the assistance of a select group of qualified technical experts, prepared and recommended implementation of required fundamental vessel construction rules. Subsequently, a technical section, to render judgment on all matters having to do with the design and construction of ships, was established within the BMIN and transferred, in 1942, to the Coast Guard.

Beginning in 1957, technical offices were established regionally as staff elements of the appropriate District Marine Safety Division; i.e., Merchant Marine Technical Branch (mmt), in the Third Coast Guard District (New York); the Fifth District (Portsmouth), which was the last to be established in 1972 and closed in 1981; the Eighth District (New Orleans); the Ninth District (Cleveland), which was closed in 1983; and the Twelfth District (San Francisco). At that time there was a need to bring the technical staff closer to the inspection areas in order to facilitate discussions between industry and the Coast Guard and to speed up and improve the plan review and approval procedures. These offices were charged with providing commercial vessel plan review services and technical guidance to Coast Guard field offices and the marine industry within their designated geographic area of responsibility.

The CVS technical functions generally involve the review and approval of vessel plans and certain shipboard equipment and systems to ensure compliance with the federal safety and pollution abatement standards. When U.S. commercial vessel interests contemplate the construction of a new vessel, their naval architects are guided by standards found in federal regulations, codes of classification and engineering societies, and "good marine practice." Vessel plans, which vary in sophistication depending upon the vessel type and size, normally are submitted for review and approval to the appropriate Coast Guard technical office (soon to be the Marine Safety Center) or, in certain specified cases, to the third-party organizations designated to act on behalf of the Coast Guard. Plans for small passenger vessels (those regulated under 46 CFR Subchapter T) are normally submitted to and reviewed by the local Officer in Charge, Marine Inspection (OCMI). During the initial inspection, the actual construction of a vessel is closely compared to the approved plans.

The idea of consolidating the field technical offices has been studied for a number of years; however, the regional workloads until recently still justified certain field technical offices. Today, the distribution and type of plan review workload has changed markedly. The continued decline in U.S. shipbuilding has had its greatest impact on standard cargo, passenger, and tank ship construction. However, an increasing number of small passenger vessels, vessels being converted from foreign-flag registry to U.S.-flag, and vessels classed by classification societies other than the American Bureau of Shipping are receiving plan review by the Coast Guard. These latter categories have not been affected by the recent agreements delegating certain plan review to third parties. Also, rather than being regionally located in a few port areas, the workload originators are now scattered throughout the country and the world.

These changes in the workload, and the fact that reductions in the work force were certain in 1986, dictated that some form of reorganization of the technical resources would be necessary if the technical services were to be continued at their current level. Thus, after studying the options again, the Coast Guard decided to consolidate the field technical offices, thereby centralizing the plan review functions. This consolidation results in staffing efficiencies without affecting the level of review or increasing the turnaround time for review.

The Marine Safety Center will be an independent Headquarters unit under the technical control of the Chief, Office of Merchant Marine Safety. Initially, the MSC will provide for the centralization of the plan review functions, simply by consolidating the field technical offices. Thus, the internal organization of the MSC will be much along the lines of its predecessor (mmt) offices; i.e., a Hull Division, an Engineering Division (Machinery and Electrical Branches) and a Cargo Division. Additionally, the MSC will become the repository for commercial vessel plan review records now retained at Headquarters by

continued on page 102

Protecting the Marine Hazardous Chemical Worker -- A Status Report

LCDR Rex J. Prosser

Historically, the Coast Guard's and marine industry's efforts to promote health and safety in the marine environment has been on prevention of explosive and oxygen-deficient atmospheres. The focus primarily has been on design, operational control through training and licensing, and the Marine Chemist program. In the mid-1970s, it was recognized there might be serious health hazards as well. The Coast Guard, recognizing that personnel working with hazardous materials might be facing adverse occupational exposures, developed regulations concerning tank entry, use of protective equipment, and exposure standards for suspected carcinogens such as benzene. In addition, the Coast Guard published guidelines on asbestos and noise in Navigation and Vessel Inspection Circulars (NVICs) 5-80 and 12-82 respectively. In 1983, the Coast Guard initiated a prototype occupational health and safety program in the Eighth Coast Guard District for its marine safety personnel. The program utilized elements of industrial hygiene, medical monitoring, and training to reduce adverse occupational exposures. It is hoped this program will be expanded to other Coast Guard Districts. The goal of the Coast Guard as specified in the Commercial Vessel Safety Operating Program Plan is to reduce adverse occupational health exposures of Coast Guard and marine safety personnel and merchant marine by 50 percent by 1992.

Who are these workers?

For the purpose of researching the magnitude of the problem, the term "marine hazardous chemical worker" (MHCW) was used to denote individuals working in the marine industry who may be exposed to potentially hazardous chemicals in the course of performing their jobs. Marine hazardous chemical workers fall into four generic categories:

— Marine chemical transport workers (tankers and barges).

-- Chemical terminal dock workers.

— Offshore oil/gas drilling and production workers.

— U.S. Coast Guard field personnel.

The U.S. Coast Guard has broad responsibility for the safety and health of MHCW personnel. This responsibility is derived in part from the Marine Inspection Laws of the United States, the Occupational Safety and Health Act, and the Outer Continental Shelf Lands Act. Each of these provides basic authority, but specifically, the provisions of 46 U.S.C. 3306(a) and 3703(a) are broad enough to authorize a comprehensive occupational safety and health program. To clarify the responsibilities in areas where the federal authority overlapped, a Memorandum of Understanding between the Coast Guard and the Occupational Safety and Health Administration was signed in March 1983.

To discharge its occupational health and safety responsibility more effectively, the Coast Guard has sponsored research to identify and document the work activities performed by MHCW personnel that involve exposure to po-

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tentially harmful substances. Additionally, occupational exposure studies have been carried out during these investigations to characterize the duration and the level of chemical concentrations to which MHCW personnel are actually exposed in their jobs. This information is needed to quantify and assess exposures and to determine whether additional regulations or implementation of voluntary standards by the marine industry are required to provide for the health and safety of MHCW personnel.

Research To Identify Hazardous Exposures

To better understand the hazards the marine hazardous chemical workers could encounter as a result of the job activities, a series of Coast Guard-sponsored research projects were initiated to

- identify potential hazardous agents in the maritime work environment,
- identify work activities with hazardous exposure potential,
- develop mathematical models, validated through field experiments, to allow prediction of work exposure levels, and
- further quantify exposures by personal sampling in the work environment.

The research projects sponsored by the Coast Guard's Office of Merchant Marine Safety were titled "Investigation of the Hazards Posed by Chemical Vapors Released in Marine Operations" and "A Crew Exposure Study." These projects accomplished the above objectives for the four generic marine hazardous chemical worker classes. The research results identified chemical agents, such as toxic/flammable vapors and gases, particulates (dust and fumes), and bulk liquids, which are potentially hazardous to worker health. Physical agents, such as noise and heat stress, were also identified as important factors in the maritime work environment affecting health and safety.

Work activities with the highest hazardous exposure potential include

- confined space entry,
- cargo transfer and gauging,
- certain maintenance activities,
- certain facility inspections,
- emergency response, and
- marine terminal work during open product loadings.

As part of the research, mathematical models were developed to predict worker exposure for work activities downwind of vents where vapor emission during cargo loading could represent a potential exposure hazard. Additional models were developed to predict residual vapor concentrations in ship and barge tanks during entry and work. These models and experimental data have shown that there is potential for worker exposures exceeding exposure values considered toxic.

Environmental monitoring utilizing personal sampling pumps and dosimeters on workers during their work activities confirmed the experimental data. Figure 1 provided a summary of vapor exposures for those work activities with the greatest exposure potential. The figure shows that for some work activities, a significant number of exposures exceeded the short-term exposure limit (STEL), a concentration to which a worker should not be exposed in

Figure 1

DISTRIBUTION OF VAPOR EXPOSURES
FOR VARIOUS WORK ACTIVITIES

ITEM	%>STEL
Periodic open gauging	14
Open tank topoff	19
Restricted gauging-sounding tube(all)	0
Tank wash and ventilating	6
Tank entry	22
Hose hookup/disconnect	5

(Results based on approximately
400 exposure samples)

excess of this value for work periods of 15 minutes or longer. It is significant to note that 22 percent of the exposures monitored during tank entry and work exceeded the STEL.

Toxicological Assessments

The research showed that a simplified definition of hazardous sources, equipment, and work practices for marine personnel was not possible, and furthermore, that the work does not follow a normal 8-hour day schedule that is characteristic of other industries. Maritime exposures are difficult to evaluate in terms of usual American Conference of Governmental Industrial Hygienists' threshold limit values (TLVs) and the Occupational Safety and Health Administration's personal exposure limits (PELs). Therefore, a method was needed to provide a toxicological assessment of the documented marine occupational exposures. The exposure data was assessed in accordance with a methodology developed specifically for marine work activities.

Toxicological assessments were made of the measured and predicted exposure data. The following conclusions were reached:

— Both the measured and the predicted exposure data indicate that the marine environment is a toxicologically hostile environment. Under certain conditions, concentrations of chemicals may be sufficiently high to cause marked toxic effects in exposed marine workers.

— Host factors (age, health, personal habits) and environmental/work conditions unique to marine operations may potentiate the toxicity of chemicals in the marine environment.

— During tank entry and open tank gauging, there is an enhanced potential for exposure to hazardous concentrations of chemical vapors.

— Because the marine environment is a toxicologically hostile and hazardous environment, the need exists to control and reduce exposures of marine workers to chemicals and to monitor their health status.

On the basis of these findings, corrective measures were recommended by the Coast Guard's contractor to reduce occupational exposures in the marine work environment. These recommendations were incorporated by the contractor into the final research study. The recommended corrective action was the implementation of a marine occupational safety and health program. This program includes an effective industrial hygiene (IH) program to control, reduce, and monitor exposure levels, and a medical monitoring program to serve as a check on the effectiveness of the IH program.

Occupational Safety and Health Program

After studying the initial research efforts, the Coast Guard has initiated a third research project entitled "Study To Improve the Health and Safety of Marine Hazardous Chemical Workers." The objective of this study is to develop a comprehensive occupational health plan that can be implemented by the maritime industry for all marine hazardous chemical workers covered by U.S. Coast Guard responsibility.

A comprehensive occupational safety and health program would include the following elements:

— Identification of hazardous workplace substances.

— Development and implementation of appropriate engineering controls to reduce workplace concentrations.

— Development and use of safe work practices.

— Establishment of maritime occupational exposure standards.

— Provision of adequate training and education regarding handling of toxic chemicals.

— Routine monitoring of environmental concentrations in confined spaces before entry.

— Establishment of routine industrial hygiene survey audits of standard work practices.

— Establishment of medical monitoring, at specified intervals, of all personnel potentially exposed to toxic chemicals in their routine duties.

On the basis of the previous research, the comprehensive occupational safety and health program specifically covers tank ship and barge personnel who work in the bulk liquid transport industry, and Coast Guard field personnel in Captains of the Port Offices, Marine Inspection Offices, and Marine Safety Offices. The program under development includes industrial hygiene and medical monitoring elements (figure 2). The major elements of the industrial hygiene part are shown in figure 3, and the medical monitoring part in figure 4. The key program interfaces are shown in figure 5. The Occupational Safety and Health Program summarized by figures 2 through 5 has resulted from a four-task research activity. The four work elements are as follows:

Task I - Background Study. The objective of this task (completed in 1984) was to perform an extensive background study in scenario form to identify and document the work activities that involve exposure to potentially hazardous chemicals for the various classes of MHCW personnel.

Task II - Environmental Monitoring. The objective of this task (completed in October 1985) was to develop an environmental monitoring program applicable to the MHCW scenarios identified in Task I. The monitoring plan includes the use of safe work practices, chemcial concentration measuring instrumentation, and personal protective equipment to minimize the workers' exposure to hazardous materials during work.

Task III - Medical Monitoring. The objective of this task (completed in January 1986) was to develop a medical monitoring program for MHCW personnel which will detect adverse health effects that are associated with the occupational exposure to hazardous materials. The medical monitoring plan involves gathering information through the use of work histories, measured exposure levels, medical questionnaires, physical examinations and laboratory tests, and an automated data base management system. The medical monitoring requirements were combined with the IH requirements to define the Occupational Safety and Health Program.

Task IV - Trial Implementation. The objective of this task is to develop a plan for implementing the Occupational Safety and Health Program in the Coast Guard and in elements of the maritime transportation industry. The 6-month trial implementation that was conducted at the Marine Inspection Office and Port Safety Station, Houston, and at the Marine Safety Office, Galveston, has been completed. Overall, the Coast Guard personnel participating in the program feel they have increased their awareness of safety and health-related issues and are performing their field marine safety duties in a safer manner. The 6-month industry implemention is scheduled to begin in July 1986.

Figure 2

ELEMENTS OF A MARINE WORKER HEALTH AND SAFETY PROGRAM

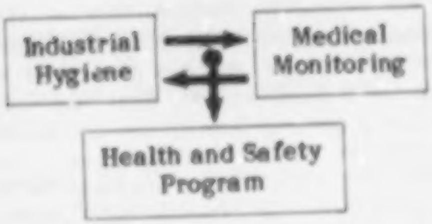


Figure 3

ELEMENTS OF INDUSTRIAL HYGIENE PROGRAM

Identification of hazardous substances in the workplace

Identification of work activities with potential exposure to hazardous substances

Development of work practices and controls to limit worker exposure

Performance of periodic occupational exposure monitoring

Review of work practices and controls to evaluate their effectiveness

The final product of this MHCW research study will be a stand-alone report which will describe the comprehensive Marine Occupational Safety and Health Program and will provide guidance on how such a program can be tailored by the various maritime interests to meet their particular needs. At this point in

Figure 4

ELEMENTS OF MEDICAL MONITORING PROGRAM

Identification and classification of marine hazardous substances

Definition of marine populations and organizations

Determination of methods for obtaining exposure information

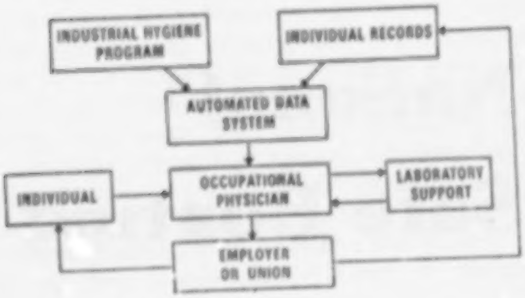
Definition of medical monitoring procedures and exam frequencies

Development of medical questionnaires and forms

Design of a supporting automated data system

Figure 5

MARINE HEALTH AND SAFETY SYSTEM INTERFACE



the project, the Coast Guard has not decided what course of action it will follow to implement this program with the maritime industry. The tentative approach is to distribute the final report via a Navigation and Vessel Inspection Circular. However, some changes to current regulations due to the cumulative findings of our research may be necessary. It is anticipated this final report will be available to the general public by the summer of 1987. The contractor has presented several oral status reports to maritime companies, marine interests, and the Coast Guard during the course of the research studies, and several additional presentations are being scheduled. Currently, several of the interim reports from the MHCW study and final reports from our previous research work are or will soon be available through the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161. These reports may be ordered as follows:

Order #AD-A 128-537, "Investigation of the Hazards Posed by Chemical Vapors Released in Marine Operations, Final Report, April 1983." Definition of marine terminal work activities and hazardous substances, quantification of hazardous exposure levels in marine terminal operations, and development of mathematical models to predict toxic and flammable concentrations in the work environment.

Order #AD-A 128-768, "Hazardous Chemical Vapor Handbook for Marine Tank Vessels, Final Report - Phase II, April 1983." A description of mathematical models developed for the marine operations study including procedures for the use of the computer programs developed for (1) near-field atmospheric dispersion of heavier-than-air chemical vapors discharged from tanks during loading, and (2) gas freeing and entry of cargo tanks.

Order #AD-A 118-179, "A Crew Exposure Study - Phase II, Volume I - Offshore. Final Report - Phase I, June 1984." Identification of work activities, hazardous substances, and a quantification of exposure levels for offshore oil and gas facility operations.

Order #AD-A 155-233 (Part A) and Order #AD-A 157-308 (Part B), "A Crew Exposure Study - Phase II, Volume II - At Sea, Part A and B, April 1985." Identification of work activities, hazardous substances, and a quantification of exposure levels during work activities on merchant vessels at sea.

The following reports will be available through NTIS after May 1, 1986. At the time this article was printed, several order numbers were not available. Please contact the Coast Guard's Cargo and Hazards Branch at (202) 426-1577 to obtain the order numbers not shown:

Order #AD-A 163-316, "Development and Application of a Method for Toxicologial Assessment of Occupational Exposures to Chemicals in Marine Operations, Addendum to Final Report, September 1985." A review of toxicological information relative to marine activities and the development of a method for toxicological assessment of marine occupational exposures.

Order #AD-A 164-718, "Development of an Environmental Monitoring Program - Volume I of Task II, Final Report, October 1985." Development of an environmental monitoring plan in support of the IH portion of the Marine Occupational Safety and Health Program. Information is provided on safe work practices, toxic and flammable gas monitoring instruments, chemical hazard information, protective equipment, and training.

Order #AD-A 164-452, "Review of Environmental Monitoring Devices -Volume II of Task II, Final Report, October 1985." Provides specific information on available instrumentation for monitoring toxic gas, oxygen, and explosiveness; can be used as a selection guide for selecting environmental monitoring instruments for a specific application.

"A Medical Monitoring Program for the Marine Hazardous Chemical Worker - Volume I of Task III, Final Report, January 1986." Provides specific information on the development of the Medical Monitoring Program for the Occupational Safety and Health Program; includes specific information on marine hazardous substances, merchant vessel personnel, guidelines for industrial hygiene, guidelines for biological monitoring, records for logging potential exposures, and data management systems.

"A Marine Hazardous Substance Data System - Volume II of Task III, Final Report, January 1986." Provides detailed information on marine hazardous substances, including classification of substances regarding their hazard potential, supporting documentation to Volume I of Task III.

"Biochemical and Medical Information for Marine Hazardous Substances - Volume III of Task III, January 1986." Presents a set of biochemical and medical information for 179 hazardous substances found in the marine environment.

Limited copies of the Toxicology Assessment and the Task II report can be obtained by calling the Hazardous Materials Branch, (202) 426-1577.

MARINE SAFETY CENTER

continued from page 96

the G-M Planning Staff (G-MP-2). The MSC will also provide a framework on which to add other related "operational" functions now performed within the Office of Merchant Marine Safety.

The MSC will be located in the Coast Guard Headquarters Building in Washington, DC. The Washington area was selected on the basis of several factors, including (1) recognition of the area as an expanding naval architect/marine engineer center (many naval architectural firms and vessel owners/builders are already physically represented in the area) and (2) the area's excellent access to domestic and international transportation.

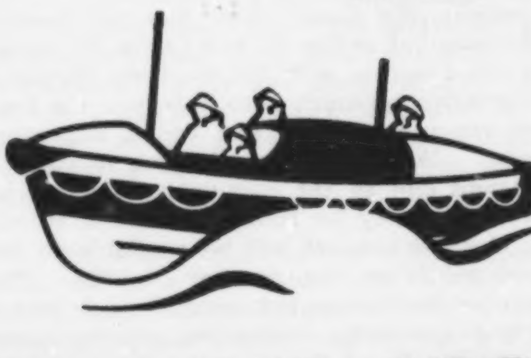
The target date for operations at the Marine Safety Center is July 1, 1986. The plan review functions will be assumed gradually, on a limited basis, by a special transition team during the preceding months to ensure a smooth transfer from the three regional field offices. About June 1, 1986, all new plan review work will be diverted from the regional offices to the transition team. The regional offices will complete, or transfer to the MSC, their ongoing projects, and they will close before October 1, 1986.

(Editor's Note: The **Proceedings** will publish the MSC's address and phone number as soon as the information is available.)

National

Safe Boating

Week



June 1-7, 1986

Automated Notices to Mariners

CAPT William J. Brogdon

A navigator prepares to visit an unfamiliar port. One of his more important, and more labor-intensive, tasks is correcting the ship's charts. He has to sort through the Notices to Mariners, listing all the applicable ones, before he can even begin the corrections.

How would you like to reduce the work by getting a listing of all Weekly corrections applicable to a specific chart? How about oil rig locations, or Hydrolants? This information is available now, by computer, from the Defense Mapping Agency.

There is a modern system in operation which uses a computer to search through the Weekly Notices to Mariners and list the appropriate corrections. Nearly any microcomputer and a 300 or 1200 baud modem can be used to gain access to the system. In order to use the system, you must first obtain authority from the Defense Mapping Agency, Hydrographic/Topographic Center (DMAHTC), Code HNN, Washington, DC 20315. DMAHTC sends a user manual and assigns an access code so that you may use the Automated Notices to Mariners system.

Using a modem, connect your computer to the telephone system. Set up the parameters as directed in the manual: full duplex, 8 bits, 1 stop bit, no parity. The end-of-line setting of XON-XFF works correctly. Set up a file to receive the notice so that you can print it later. **Note:** The telephone area code is 301, not 202, as listed in the manual.

The system works beautifully. It saves a great deal of the research which is necessary to extract information from the Weekly, and it makes chart correction much simpler. In port, you have only to gain access to a telephone line with a personal computer. There is no charge for using the system, but of course you must pay the telephone charges. Ships at sea with satellite communications can link with a telephone line by satellite to get the latest corrections. It takes a few minutes to get the corrections for one chart at 300 baud, the slowest rate.

The list of corrections does not, however, contain all the information. The Weekly was designed for large ships, and it excludes much information for channels less than 15' deep. Neither does it have the discrepancies and the temporary changes which are included in the Coast Guard's Local Notice to Mariners.

The Coast Guard is moving toward an automated Local Notice to Mariners capability. The first step requires the Districts to adopt a standard format for Locals, and to transmit them to Headquarters by modem rather than by mail. We intend to have a data base for the Local at each Coast Guard District; users will be able to extract information from it.

It is part of a larger project to tie together the Broadcast Notices to Mariners, the Local Notice to Mariners, the Light List, and servicing information used by Coast Guard units. The project is designed to make the information more accurate, more timely, and far easier to use. The **Proceedings** will provide further information on this project as it develops. For now, though, a navigator can get many benefits from the DMAHTC Automated Notice to Mariners system. ⚓

Captain William J. Brogdon is Deputy Chief, Office of Navigation, U.S. Coast Guard Headquarters.

Statistics of Casualties

Annually, the Coast Guard presents a statistical summary of commercial vessel casualties that were investigated by Coast Guard marine investigators during the calendar year. The public, industry, and the Coast Guard have used the findings of the investigations to establish standards and determine the need for legislation to improve the protection of safety of life and property at sea.

The master of a vessel is required by law to report a marine casualty within 5 days after its occurrence to the nearest Coast Guard Marine Inspection Office or Marine Safety Office. The following summary represents casualties for which reports were received at Coast Guard Headquarters during calendar year 1983. These casualties, involving commercial vessels, were required to be reported to the Coast Guard whenever the casualty resulted in any of the following:

- an accidental grounding or an intentional grounding which also meets any of the other reporting criteria or creates a hazard to navigation, the environment, or the safety of the vessel;
- loss of main propulsion or primary steering, or any associated component or control system, the loss of which causes a reduction of the maneuvering capabilities of the vessel. Loss means that systems, component parts, subsystems, or control systems do not perform the specified or required function;
- an occurrence materially and adversely affecting the vessel's seaworthiness or fitness for service or route, including but not limited to fire, flooding, or failure of or damage to fixed fire extinguishing systems, lifesaving equipment, auxiliary power generating equipment, or bilge pumping systems;
- loss of life;
- injury causing a person to remain incapacitated for a period in excess of 72 hours; or
- an occurrence not meeting any of the above criteria but resulting in damage to property in excess of $25,000. Damage includes the cost of restoring the property to the service condition which existed prior to the casualty, but must exclude the cost of salvage, gas freeing, and drydocking. It also does not include such items as demurrage.

Every event involving a vessel or its personnel which meets any of the conditions of a reportable casualty is of great concern to the Coast Guard. A number of reportable casualties are not investigated by the Coast Guard simply because they are not reported. Thus, it is of the utmost importance that the masters of all vessels ensure that all casualties are reported.

Major Casualties That Occurred in Calendar Year 1983

Two major casualties resulting in total loss occurred in 1983. These are described on the following page:

Calendar Year 1983

Collier MARINE ELECTRIC

At 0251, February 12, 1983 (all times are Eastern Standard Time, +5 zone time), the collier MARINE ELECTRIC, while enroute from Norfolk, Virginia, to Brayton Point, Massachusetts, with a full load of steam coal, reported to the Coast Guard that she was taking on water and going down by the head. Gale-force weather conditions existed at the time. At 0415, February 12, 1983, as the vessel's crew was preparing to abandon ship, the MARINE ELECTRIC capsized, throwing most of the 34 crewmen into the water. Rescue efforts by U.S. Coast Guard and U.S. Navy aircraft and surface vessels and by merchant vessels resulted in the recovery of 3 survivors and 24 bodies. Seven persons remain missing and are presumed dead. The overturned stern of the vessel remained visible until approximately 1130, February 12, 1983. At that time, the vessel sank in about 120 feet of water, approximately 30 nautical miles east of Chincoteague, Virginia. The Commandant has determined that the actual cause of the casualty is unknown. The most probable cause was determined to be the wasted top plating of the dry cargo hatch and wasted main deck plating which permitted boardings seas to flood the vessel's forward spaces.

Drillship GLOMAR JAVA SEA

About 2355 on October 25, 1983, the 400-foot-long U.S. drillship GLOMAR JAVA SEA capsized and sank during Typhoon Lex in the South China Sea about 65 nautical miles south-southwest of Hainan Island, People's Republic of China. Of the 81 persons who were aboard, 35 bodies have been located, and the remaining 46 persons are missing and presumed dead. The GLOMAR JAVA SEA is currently resting on the bottom of the sea in an inverted postion in about 315 feet of water; its estimated value was $35 million.

The actual cause of this casualty and the actual sequence of events was not established with certainty. However, the most probable cause was a result of the following combination of factors: the shifting of the vessel's cargo, the loss of the vessel's watertight integrity, the vessel's substantial list which affected stability, and finally, the severe environmental conditions of Typhoon Lex. These factors led to the eventual capsizing and sinking of the drillship GLOMAR JAVA SEA.

The statistical tabulation presented below is intended to summarize the casualty experience for the entire commercial fleet. Because the summary is so all-encompassing, use of the statistics may lead to erroneous conclusions if the limitations of the data are not well understood. The Marine Safety Evaluation Branch of the Marine Investigation Division will gladly asist in quantifying those limitations for each specific need.

Comments and recommendations for changes or improvements in the statistics should be addressed to Commandant (G-MMI-3), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593.

Tables of statistics begin on the next page.

Table 1

Summary of Commercial Vessel Total Losses by Nature of Casualty and Vessel Size for 1983

	FOUNDERED		FIRE/EXPLOSION		COLLISION		GROUNDING		HULL/MACHINERY DAMAGE		MISSING		OTHER	
	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT
FREIGHTSHIP														
Less than 100 GT			1		1	46								
100-199														
200-299														
300-499														
500-1599														
1600-4999														
5000-9999														
10,000-19,999	1	13757												
20,000 and Above														
TANKSHIP														
Less than 100 GT														
100-1599														
1600-4999														
5000-9999														
10,000-19,999														
20,000-39,999														
40,000-99,999														
100,000 and Above														
PASSENGER VESSEL (inc. ferries)														
Less than 100 GT	6	261	1	20	1	16			2	89				
100-1599														
1600-4999														
5000 and Above														
TUG/TOWBOAT														
Less than 100 GT	14	751	3	179	1	92			1	87				
100-199	13	2055	3	484	1	192	1	123						
200-299														
300-999			2	674	1	459								
1000 and Above														
OFFSHORE SUPPLY														
Less than 100 GT							1	198						
100-199														
200-499														
500 and Above														
MODU														
Less than 300 GT	2	291	1	79										
300 GT and over	1	5930												
PLATFORM														
FISHING VESSEL														
Less than 100 GT	86	3160	57	2240	29	1057	22	721	19	605			4	167
100-199	14	2014	7	1006	1	101	3	427	1	117				
200-499	1	331												
500-999														
1000 and Above														
State Numbered	16	102	9	12	5		1		5		2		1	
TANK BARGE														
Less than 500 GT	1													
500-999			1	835	1	760	1	680						
1000 and Above			1	1434			1	1522						
FREIGHT BARGE														
Less than 100 GT					2				1					
100-999	1	794			4	3368	1	799	1	694			2	988
1000 and Above	1	1400			2	2598	1	1617					1	2168
Unknown														
MISCELLANEOUS														
Less than 100 GT	8	231	3	87	7	34	1	7					1	
100 and Above (SP)							1	172						
100 and Above (NSP)	3	361							2	611				
FOREIGN FLAG														
Freight	1	2295												
Tank														
Other														

Table 2A

Total Losses During 1983
Type of Vessel by Age of Vessel

Type vessel Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FREIGHTSHIP	1						2	
TANKSHIP								
PASSENGER VESSEL (inc. ferries)	1		1	2	2	1	3	
TUG/TOWBOAT	6	7	5	6	2	3	10	1
OFFSHORE SUPPLY			1					
MODU		3	1					
PLATFORM								
FISHING VESSEL	44	44	37	24	17	13	62	3
STATE NUMBERED	5	2	6	8	3		12	3
TANK BARGE	1			1		1	2	1
FREIGHT BARGE	3	2	4	3			4	1
MISCELLANEOUS	6	2		4	1	4	5	4

Table 2B

Total Losses During 1983
Nature of Casualty by Age of Vessel

Casualty Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FOUNDERED	27	25	23	22	11	7	51	4
FIRE/EXPLOSION	25	15	11	12	5	7	12	1
COLLISION	7	5	13	3	4	3	14	6
GROUNDING	6	5	2	6	3	2	9	1
HULL/MACHINERY DAMAGE	1	8	6	3	2	2	9	1
MISSING		1		1				
OTHER	1	1		1		1	5	

Table 3

Summary of Commerical Vessels Not Involved in a Total Loss by Nature of Casualty and Vessel Size for 1983

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY DAMAGE	WEATHER DAMAGE	OTHER
	No.	No.	No.	No.	No.	No.	No.
FREIGHTSHIP							
Less than 100 GT			3	9	9		5
100-199			6	2	2		
200-299			10	2			
300-499				1			
500-1599			8	5	1		3
1600-4999			8	5	6		2
5000-9999	1	4	13	10	6		1
10,000-19999	2	7	51	31	49	6	13
20,000 and Above		4	22	38	44	3	10
TANKSHIP							
Less than 100 GT					2		
100-1599			5	3	3		1
1600-4999			3	1	2		1
5000-9999		2	1	5	1		2
10,000-19,999		4	16	18	23	1	6
20,000-39,999		5	15	29	18	3	5
40,000-99,999		2	9	10	15		1
100,000 and Above					3		
PASSENGER VESSEL (inc. ferries)							
Less than 100 GT	12	11	39	33	55	3	14
100-1599			6	4	19		3
1600-4999	1	1	2	5	5		1
5000 and Above			1		1		
TUG/TOWBOAT							
Less than 100 GT	11	14	98	91	30	4	36
100-199	7	15	179	164	40	2	33
200-299	1	6	55	82	9		6
300-999		4	81	264	25		1
1000 and Above			7	33	4		3
OFFSHORE SUPPLY							
Less than 100 GT	1	3	10	6	3	2	4
100-199		1	8	3	3	1	
200-499		2	17	1	2	1	1
500 and Above							
MODU							
Less than 100 GT			1		1	1	2
100-299	1		2			2	
300 GT and Above		1	22	1	5	3	6
PLATFORM		4	6	2	1		3
FISHING VESSEL							
Less than 100 GT	80	44	76	111	301	7	128
100-199	18	8	30	44	75	1	24
200-499		2		2	1		3
500-999		2	1	2			1
1000 and Above		2	1	1	1		1
State Numbered	7	5	7	24	28		22

Table 3
(continued from previous page)

	FLOODED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	WEATHER DAMAGE No.	OTHER No.
TANK BARGE							
Less than 100 GT			4	12			
100-499				4	2	1	4
500-999			34	97	10	9	4
1000 and Above	1	5	142	218	28	2	15
FREIGHT BARGE							
Less than 100 GT			1	2			
100-999	1	3	227	468	44		50
1000 and Above	4		65	109	6	1	18
Unknown			51	86	4		16
MISCELLANEOUS							
Less than 100 GT	1	4	155	8	28	2	62
100 and Above (SP)	5	6	12	106	4		1
100 and Above (NSP)	2	2	18	6	4		4
FOREIGN FLAG							
Freight	2	5	69	74	36	1	20
Tank		6	21	27	8		10
Other		2	14	10	3		2

Table 4A

Vessels Not Involved in a Total Loss During 1983
Type of Vessel by Age of Vessel

Type vessel Age	0–4	5–9	10–14	15–19	20–24	25–29	30 & Above	UNKNOWN
FREIGHTSHIP	92	77	86	47	38	6	48	8
TANKSHIP	33	60	35	14	26	13	32	1
PASSENGER VESSEL (inc. ferries)	41	43	37	23	14	22	35	1
TUG/TOWBOAT	312	301	158	157	83	105	186	13
OFFSHORE SUPPLY	34	23	8	3		1		
MODU	31	7	3	2	1	2		2
PLATFORM	3	1		2				10
FISHING VESSEL	152	177	123	125	54	47	275	14
STATE NUMBERED	17	14	14	13	5	6	12	12
TANK BARGE	105	122	120	93	52	25	41	34
FREIGHT BARGE	385	255	151	115	54	26	17	153
MISCELLANEOUS	92	43	37	39	21	25	35	138

Table 4B

Vessels Not Involved in a Total Loss During 1983
Nature of Casualty by Age of Vessel

Casualty Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FLOODED	24	28	16	22	8	13	39	6
FIRE/EXPLOSION	38	29	35	17	12	6	30	6
COLLISION	414	342	187	142	85	67	136	155
GROUNDING	534	461	326	289	135	92	163	158
HULL/MACHINERY DAMAGE	156	180	126	103	76	60	196	26
WEATHER DAMAGE	21	5	10	5	8	1	3	2
OTHER	110	78	73	55	24	39	114	33

Table 5A

Summary of Commercial Vessel Casualties During 1983
by Cause* and Nature of Casualty

PERSONNEL	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Inatt. to duty	1		6	4	1		1
Judgmental error	8	1	102	196			5
Carelessness	7	9	8	7	2		1
Lack of knowledge	1		5	9			
Relied on floating AtON				2			1
Failed to							
Account wind/current	2		93	119			
Use nav. equip/charts				5			
Use radiotelephone							
Ascertain position			2	54			1
Establish Pass Agreement			11	1			
Keep Proper Lookout	2		30	11			
Keep Right of Channel			2				
Comply w/Rule, Reg, Procedure		2	12	1			
Proceed at Safe Speed	1		8	2			4
Yield Right of Way			2				
Stress							
Fatigue			3	17			
Physical impair.			1	1			
Intoxication			1	1			
Improper Loading	19	1			2		
Improper Maintenance	9	7			37		2
Improper Mooring/Tow	8		6	2	2		10
Improper Securing/Rigging	15		1	1			
Improper safety Precaut	1	2	2				2
Operator Error	21	5	90	199	12		11
Other	14	6	24	34	11		3

* Cause is first one listed in each record

Table 5B

Summary of Commercial Vessel Casualties During 1983 by Cause* and Nature of Casualty

ENVIRONMENT	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Adverse weather	33		31	103	12		44
Adverse current	20		27	13	11		23
Debris	1		8		7		1
Ice	1		2	2	1		
Lightning					1		
Shoaling			3	159	2		
Submerged object	4		95	2			
Channel hazard			9	76			2
Inadequate AtoN							
Other	1		10	8			

Table 5C

Summary of Commercial Vessel Casualties During 1983 by Cause* and Nature of Casualty

MATERIAL RELATED	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Failed Materials:							
Structural	116	11	15	18	48		21
Mechanical	57	34	5	3	346		15
Electrical		33	1	4	50		25
Corrosion					11		
Normal wear			1		29		
Improper welding	1	2	1		5		
Improper riveting							
Steering failure			4	2	2		
Fouled propeller	2			5	8		56
Inadequate:							
Lighting			2				
Stability	5						1
Lifesaving equip							
Firefighting equip							1
Controls		1					
Lubrication					14		
Maintenance				1	19		10
Insufficient fuel			4	9	2		5
Propulsion Failure					16		
Fatigue Failure	2	1	9	12	8		1
Other							
NEC	28	25	5	40	60		25
CAUSE UNKNOWN	96	107	57	23	115	4	12

* Cause is first one listed in each record

Table 6

Deaths/Injuries Resulting from Total Loss of Commercial Vessels During 1983

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY	MISSING	OTHER	TOTAL
FREIGHTSHIP	31/0							31/0
TANKSHIP								
PASSENGER VESSEL	0/1							0/1
TUG/TOWBOAT	16/3							16/3
OFFSHORE SUPPLY								
FISHING VESSEL	54/5	0/4	3/0	3/0	2/1		1/0	63/10
STATE NUMBERED	11/0	0/4	1/2		2/0	6/0		20/6
MODU	81/0							81/0
PLATFORM								
FREIGHT BARGE								
TANK BARGE								
MISCELLANEOUS	3/1		4/0					7/1
TOTAL								218/21
LICENSED OFFICER	20/0		0/1					20/1
CREW	175/8	0/6	4/1	3/0	4/1	6/0	1/0	193/16
PASSENGER	1/2		3/0					4/2
OTHER		0/2	1/0					1/2

Table 7

Deaths/Injuries Resulting from a Commercial Vessel Not Involved in a Total Loss During 1983

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY	WEATHER DAMAGE	OTHER	TOTAL
FREIGHTSHIP		0/3	0/2		1/1		2/3	3/9
TANKSHIP		0/4	0/1		1/1		0/1	1/7
PASSENGER VESSEL		0/2	0/4	1/3	0/2		0/3	1/14
TUG/TOWBOAT		0/7	7/6		1/2	0/1	1/8	9/24
OFFSHORE SUPPLY		2/0	0/6	0/1		0/3		2/10
FISHING VESSEL	0/1	2/3	1/4	0/3	0/1		3/0	6/12
STATE NUMBERED		1/0	0/1	1/0			3/0	5/1
MODU			0/2		4/7	0/1	0/1	4/11
PLATFORM		0/1						0/1
FREIGHT BARGE			0/1				5/0	5/1
TANK BARGE		0/2	1/1		0/1		1/9	2/13
MISCELLANEOUS		1/3	2/11	0/2	0/1		3/2	6/19
TOTAL								44/122
LICENSED OFFICER		0/5	0/1		0/1	0/1	0/2	0/10
CREW		5/16	5/20	1/4	7/13	0/4	15/17	33/74
PASSENGER		0/1	6/15	1/3			2/3	9/22
OTHER	0/1	1/3	0/3	0/2	0/2		1/5	2/16

Table 8

Other Deaths/Injuries Onboard Commercial Vessels During 1983 (Not Related to a Vessel Casualty)

	SLIP/ FALL ONBOARD	FALL OVER BOARD	DISAPPEAR	STRUCK BY OBJECT	PINCH OR CRUSH	BURN SCALD	ELECTRIC BURN/ SHOCK	CUT	CAUGHT IN LINES	ASPHIXIA	SPRAIN OR STRAIN	DIVING	UNKOWN OR NOC	TOTAL
FREIGHTSHIP	4/73	2/	2/	7/34	4/27	/7	1/2	/10		1/	/18		5/69	26/240
TANKSHIP	1/20	1/		1/19	/8	/2		/1	/2	3/	/11		/21	6/84
PASS. VSL.	/19	3/5	1/	/6	1/5					1/		7/2	2/16	15/53
TUG/TOWBOAT	/15	15/3	1/	1/17	1/6	/2			/3		/5		1/10	19/61
OFFSHORE SPLY	/6	3/		3/6	1/3			/1	/1	1/	/5	/2	/6	8/30
FISHING VSL.	1/9	12/2	6/	2/17	/16	/1	1/	/3	/2	1/2	/3	3/	5/18	31/73
STATE NUMBERED		1/	2/	/2						4/		1/1	1/3	9/6
MODU	1/39	1/2		3/53	/37	/9		/2	/3		/30		/47	5/222
PLATFORM	1/92	3/4	2/	1/76	/58	/20	1/1	/10	/4	2/	/90	/3	/112	10/470
FREIGHT BARGE	/1	2/		/1							/1	1/		3/3
TANK BARGE	/3			/1			/1			2/	/1		/5	2/11
MISCELLANEOUS	/1	2/		/1	1/6							2/1	1/6	6/15
TOTAL														140/1268
LICENSED OFFICER	/24	2/		2/14	1/14	/3	/1		/1	3/	/3		1/17	9/77
CREW	6/241	34/11	13/	13/203	5/144	/36	3/3	/25	/14	7/1	/153	3/1	8/266	92/1098
PASSENGER	/6	3/5	1/	/4	/3					1/		8/2	2/9	15/29
OTHER	2/7	6/		3/12	2/5	/2		/2		4/1	/8	3/6	4/21	24/64

Table 9

Summary of Commercial Vessel Casualties and Involvements by Nature of Casualty for 1983

Involvements With Total Losses	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.	TOTAL
Casualties	165	83	56	36	34	2	9	385
Involvements	165	89	56	36	34	2	9	391

Involvements Without Total Loss	FLOODED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	WEATHER DAMAGE No.	OTHER No.	TOTAL
Casualties	150	167	665	1113	804	45	398	3342
Involvements	156	173	1528	2156	923	55	519	5512

Maritime Licensing, Certification, and Training

In each issue of the **Proceedings**, the column "Nautical Queries" contains material that is representative of questions asked on Coast Guard licensing examinations. Staff at the U.S. Coast Guard Institute prepare "Nautical Queries" using a variety of reference works. The Institute's staff receives many inquiries about the reference publications used, so as a service to **Proceedings** readers, we are publishing a list of primary references used to develop questions for deck licenses and certificates.

Readers who wish to obtain copies of these publications should contact the commercial publisher or should place orders through local nautical bookstores or distributors. Government publications are available at government bookstores, the U.S. Government Printing Office, or through distribution agents for the Defense Mapping Agency and National Ocean Survey.

Many "Nautical Queries" questions in the data bank are developed from publications that have now been superseded; however, the answers can usually be determined from the current references. While the publications listed in this article are the ones used at the Institute, any authoritative, recognized publication similar to the texts listed can substitute as a study resource.

Government Publications

Defense Mapping Agency
Hydrographic/Topographic Center
Office of Distribution Services
Attention: DOCS
Washington, DC 20315-0010

American Practical Navigator - Vols. I & II

International Code of Signals - HO102

Radio Navigational Aids - PUB117A

Sight Reduction Tables, Vol. 2 - HO229

Radar Navigation Manual - HO1310

Maneuvering Board Manual - HO217

Nautical Chart Symbols and Abbreviations - Chart No. 1

National Ocean Survey
Riverdale, MD 20737-1199

Tide Tables

Tidal Current Tables

United States Coast Pilot - Vols. 2 & 3

Coast Guard
G-CMA-3
2100 Second St., SW
Washington, DC 20593

Light Lists, Vols. I, II, and V

Manual for Safe Handling of Flammable and Combustible Liquids (CG-174)

Navigation Rules (M16672.2A)

Chemical Data Guide for Bulk Shipment by Water (M16616.6)

Merchant Ship Search and Rescue Manual (M16130.1)

Miscellaneous

Nautical Almanac - U.S. Naval Observatory

Marine Fire Prevention, Firefighting, and Fire Safety - Maritime Administration (MARAD)

Ship's Medicine Chest and Medical Aid at Sea - U.S. Department of Health, Education and Welfare

33 CFR 1-199, Government Printing Office

46 CFR 1-40, Government Printing Office

46 CFR 40-69, Government Printing Office

46 CFR 90-105, Government Printing Office

46 CFR 140-155, Government Printing Office

46 CFR 156-165, Government Printing Office

49 CFR 100-177, Government Printing Office

References Published by
Cornell Maritime Press
P.O. Box 456
Centreville, MD 21617

Tugs, Towboats and Towing - Brady

Primer of Towing - Reid

Modern Ships - LaDage

Guide to Sound Ship Structure - D'Arcangelo

Ship Business, Cargo Loss and Damage - McFarland & Wells

Introduction to Steel Shipbuilding - Baker

The Business of Shipping - Kendall

Shipmaster's Handbook on Ship's Business - Martin

Purser's Handbook - Armstrong

Chartering and Charter Parties - Cooley

Nautical Rules of the Road - Farnsworth

Automatic Radar Plotting Aids Manual - Bole and Jones

Mariner's Gyro Navigation Manual - O'Hara

Ship Handling in Narrow Channels - Plummer

Shiphandling for the Mariner - MacElrevey

Stability and Trim for the Ship's Office - LaDage and Van Gemert

American Merchant Seaman's Manual - Haylor

Tanker Operations - Marton

Encyclopedia of Nautical Knowledge - McEwen and Lewis

Merchant Marine Officer's Handbook - Turpen and MacEwan

References Distributed in the
United States by
Sheridan House
145 Palisade Street
Dobbs Ferry, NY 10522

Ship Stability - Derrett

Basic Shiphandling - Willerton

Thomas' Stowage - Thomas, Agnew and Cole

Tanker Handbook for Deck Officers - Baptist

Merchant Ship Construction - Pursey

Practical Ship-Handling - Armstrong

Nicholl's Seamanship and Nautical Knowledge - Cockcroft

Liquefied Petroleum Gas Tanker Practice - Woolcott

The Boatswain's Manual - Miller

Seamanship Notes - Kemp and Young

Notes on Cargo Work - Kemp and Young

Business Law and the Shipmaster - Hopkins

Ship Construction, Sketches and Notes - Kemp and Young

The Oil Rig Moorings Handbook - Vendrell

Notes on Meteorology - Kemp and Young

References Published by
The Petroleum Extension Service
University of Texas at Austin
BRC-2, 10100 Burnet Road
Austin, TX 78758

Rotary Drilling Series

- Unit I, Lesson 10 - Safety on the Rig
- Unit V, Lesson 2 - Spread Mooring Systems
- Unit V, Lesson 3 - Buoyancy, Stability and Trim
- Unit V, Lesson 4 - Jacking Systems and Rig Moving Procedures

Unit V, Lesson 6 - Vessel Inspection and Maintenance

Unit V, Lesson 7 - Helicopter Safety

Unit V, Lesson 8 - Offshore Crane Operations

Unit V, Lesson 9 - Life Offshore

References Published by
U.S. Naval Institute
2062 Generals Highway
Annapolis, MD 21401

Farwell's Rules of the Nautical Road - Bassett and Smith

Weather for the Mariner - Kotsch

Heavy Weather Guide - Kotsch and Harding

How To Survive on Land and Sea - Craighead

The Use of Radar at Sea - Wylie

Dutton's Navigation and Piloting - Maloney

References — Other Publishers

Knight's Modern Seamanship - VanNostrand
Reinhold Publishing Co.
450 W. 33rd St.
New York, NY 10001

Meteorology - Dunn
McGraw-Hill
Princeton-Hightstown Rd.
Hightstown, NJ 08520

Piloting, Seamanship and Small Boat Handling - Chapman
Hearst Corp.
959 Eighth Ave.
New York, NY 10001

This Is Sailing - Creagh-Osbourne
Hearst Corp.
959 Eighth Ave.
New York, NY 10001

The Deckhand's Manual
Inland Waterways Safety Service Co.
PO Box 6476
New Orleans, LA 70114

Cargo Handling - Immer
Work Saving International Co.
1638 19th St., NW
Washington, DC 20009

Water Survival and You
Harry Lundeberg School of Seamanship
Piney Point, MD 20674

Inquiries about this material should be directed to Mr. Barry Farnsworth, U.S. Coast Guard Institute, telephone (405) 686-4417. We wish to thank Mr. Stewart Walker, Chief, Deck Branch, U.S. Coast Guard Institute, for compiling this list for the ***Proceedings.***

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. Auxiliary boilers are divided into several classifications, one of which is

A. watertube supercritical circulation.
B. watertube forced circulation.
C. firetube controlled circulation.
D. firetube express circulation.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

2. What is the average piston speed of an engine with a 12-inch stroke operating at 900 RPM?

A. 450 ft/min
B. 900 ft/min
C. 1500 ft/min
D. 1800 ft/min

Reference: Maleev, Diesel Engine Operation and Maintenance

3. A pressure-velocity compounded impulse turbine consists of

A. velocity compounded with reaction pressure compounding.
B. several rows of moving blades attached to diaphragms.

C. two or more stages of velocity compounding.
D. two or more rows of nozzles in which there is no pressure drop.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

4. Trunk-type diesel engine pistons are most effectively cooled by heat

A. radiated through the engine block.
B. conducted through the piston crown.
C. transferred to water-cooled cylinder walls.
D. transferred to lube oil on the cylinder wall.

Reference: Henshall, Medium and High Speed Diesel Engines for Marine Use

5. Which of the following conditions would cause only one burner solenoid valve to close on an automatically fired, two-burner boiler?

A. Loss of the forced draft fan
B. Low boiler water level
C. High boiler water level
D. A faulty coil in the solenoid valve

Reference: 46 CFR 63.05-50

DECK

1. The water pressure in a flooded compartment open to the sea is greatest along the

A. bulkheads adjacent to the holed plating.
B. bulkhead opposite the holed plating.
C. deck.
D. overhead.

Reference: Ladage, Stability and Trim for the Ship's Officer

2. Advection fog is most commonly caused by

A. air being warmed above the dew point.
B. a warm continental air mass moving over the ocean.
C. a rapid cooling of the air near the surface of the earth at night.
D. warm, moist air being blown over a colder surface.

Reference: Donn, Meteorology

3. Longitudinal distribution of cargo has an effect on

A. GM.
B. trim.
C. the rolling period.
D. all of the above.

Reference: Ladage, Stability and Trim for the Ship's Officer

4. Which vessel sounds the same fog signal when underway or at anchor?

A. A sailing vessel
B. A vessel restricted in her ability to maneuver
C. A vessel constrained by her draft
D. A vessel not under command

Reference: COMDTINST M16672.2A

5. Some grade B cargoes can be lost through

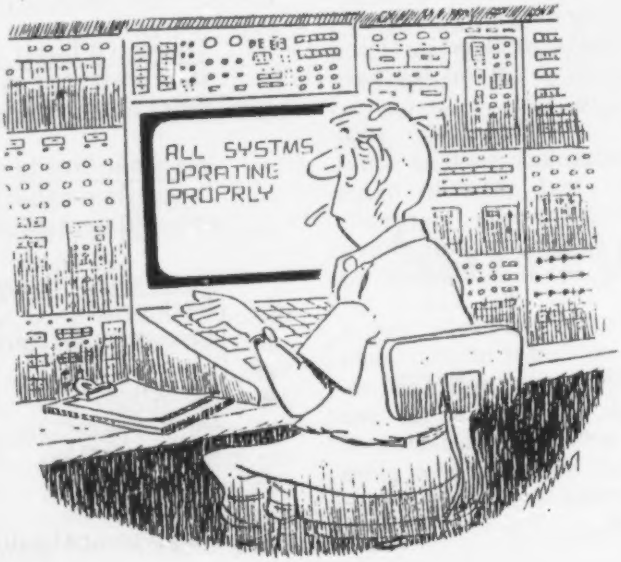
A. condensation.
B. gravitating.
C. evaporation.
D. thieving.

Reference: Baptist, Tanker Handbook for Deck Officers

ANSWERS

ENGINEER
1-B;2-D;3-C;4-C;5-D
DECK
1-C;2-D;3-B;4-B;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.



Chemical of the Month **Hung M. Nguyen**

Vinyl Chloride

Vinyl chloride is a very important commercial monomer having the group $(CH_2{=}CH\text{-})$. It is made from the reaction of acetylene and hydrochloric acid and is produced either as a liquid or gas. It is colorless and has a pleasant, sweet odor. At ambient temperatures, vinyl chloride is a flammable gas. It has a severe explosion risk at concentrations of 30,000 parts per million. Although it is heavier than air, vinyl chloride may travel a considerable distance to a source of ignition and then flash back. Fires involving vinyl chloride result in the production of highly toxic combustion products, such as hydrogen chloride and carbon monoxide.

At temperatures between 20°C and 100°C, molecules of vinyl chloride polymerize to become polyvinyl chloride. Because of its low price and excellent properties, polyvinyl chloride is used in large quantities in the production of fibers, film, pipes, rubber products, molded articles of all kinds, artificial leather, and coatings.

In combination with other compounds such as vinyl acetate, vinyl chloride helps produce polymeric materials that are tough, flexible, have good electrical insulating properties, and strong resistance to chemical degradation. Because of these characteristics, these materials are used for sheeting upholstery, luggage, packaging, and for electrical insulation. They are also used for coating and molding resins.

In 1974, a rare liver cancer called angiocarcinoma was found in and linked to workers in vinyl chloride manufacturing plants. As a result of this linking, standards have been developed to limit workers' exposure to less than a one part per million average over an 8-hour day. The Food and Drug Administration has banned the use of polyvinyl chloride in food packages because there is evidence that they might contain traces of vinyl chloride. In addition, vinyl chloride's use in aerosol sprays has also been prohibited.

Chemical name:	Vinyl Chloride
Formula:	$CH_2{=}CH\text{-}$
Synonyms:	chloroethylene VCL vinyl c monomer VCM chloroethene
Physical Properties:	
boiling point:	-13.8°C (7.2°F)
freezing point:	-153°C (-244.8°F)
vapor pressure: 20°C (68°F)	2300 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	200 ppm; 516 mg/m^3
short term exposure limit:	500 ppm; 1290 mg/m^3
Flammability Limits in Air	
lower flammability limit:	4% by volume
upper flammability limit:	26% by volume
Combustion Properties	
flash point:	-77°C (-108°F)
autoignition temperature:	472°C (882°F)
Densities	
liquid (water=1):	0.969
vapor (air=1):	2.2
U.N. Number:	1086
CHRIS Code:	VCM
Cargo compatibility group:	35 (Vinyl Halides)

Hung M. Nguyen was a First-Class Cadet at the Coast Guard Academy when this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

All persons handling vinyl chloride should avoid direct contact with the chemical. They should wear gas-tight safety goggles, rubber gloves, aprons, shoes, and a self-contained breathing apparatus. Inhalation of vinyl chloride gas at high concentrations can cause dizziness, anesthesia, and lung irritation. If the chemical is inhaled, move the victim to fresh air. If the victim's breathing has stopped, artificial respiration must be given. Because liquid vinyl chloride will cause frostbite of the skin, the affected area should be washed with plenty of water for at least 15 minutes, and the contaminated clothing should be removed. A physician should be notified.

Vinyl chloride is normally shipped as a liquefied compressed gas in pressure cylinders and tank cars. The U.S. Department of Transportation lists vinyl chloride in Part 172.101 of Title 49, Code of Federal Regulations, as a flammable compressed gas. The International Maritime Dangerous Goods Code (IMDG) lists it on page 2123. In the bulk mode, the U.S. Coast Guard regulates vinyl chloride as a liquefied gas under Subchapter O of Title 46, Code of Federal Regulations. The International Maritime Organization (IMO) includes it in its Gas Code. ⚓

Keynotes

Final Rule

CGD 84-091, International Regulations for Preventing Collisions at Sea; 1972 COLREGS Demarcation Lines (March 6)

The Coast Guard has updated the identifiable lines to delineate water upon which International Regulations for Preventing Collisons at Sea, 1972 (COLREGS) apply and waters upon which Inland Navigation Rules apply. These rules become effective on April 7, 1986.

Notice of Proposed Rulemaking

CGD 85-098, Boating Safety; Fuel System Standard (March 20)

The Coast Guard proposes to amend its regulations on fuel systems for recreational boats by incorporating SAE Standard J 1527, December 1985. The intended effect of the proposed amendments is to specify four grades of fuel hose that are more resistant to alcohol permeation which results from an increasing level of aromatics and alcohol in the fuels. Comments must be received on or before June 18, 1986.

Interim Final Rule

CGD 86-016, Combination Load Lines (March 24)

This interim final rule corrects an unintended inequity in the present load line regulations for unmanned deck cargo barges which operate in both the Great lakes and the ocean (dual service). This interim final rule allows the use of the equivalent of a Great Lakes summer load line mark on dual service stability limited deck cargo barges.

Confirmation of Interim Rule as Final

CGD 85-094, Licensing of Pilots; Annual Physical Examination (March 31)

This confirms without change the interim final rule published on December 23, 1985, that amended the annual physical examination requirements for pilots to allow first-class pilots to take the required physical examination at any time during the calendar year, with the stipulation that the time between each physical examination may not exceed 13 months. This rule provides flexibility in scheduling physical examinations in order to accommodate the employment practices in the merchant marine.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

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Admiral James S. Gracey, USCG
Commandant

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Cover

This Coast Guard photo shows the devastating consequences when an oil rig burns. Our story about the GETTY OIL WEST CAMERON 405-A begins on page 123.

Disaster Strikes When Natural Gas Vapors Migrate

Thomas J. Pettin

Around midnight on May 13, 1984, an explosion and subsequent fire occurred on GETTY OIL WEST CAMERON 405-A. One roustabout was killed in the explosion, and another was badly burned. Fortunately, they were the only two workers on the platform at the time. The damage sustained to the platform was estimated at $750,000.

GETTY OIL WEST CAMERON 405-A is a fixed, bottom-founded platform supporting two decks, and it is permanently attached to the seabed of the Outer Continental Shelf (OCS) by steel pilings. The upper deck houses the quarters and the galley, while the lower deck houses production equipment and is located 54 feet 6 inches above mean low water. The platform was constructed on site in the Gulf of Mexico in 1978 and is equally owned by Getty Oil, Cities Service, and Tenneco Oil Companies. The Getty Oil Company began operations on the platform in 1979.

On the night of the casualty, the two men were in the process of flushing sand that had begun to clog the platform test separator. (When both oil and gas are produced, a test separator is employed to separate relatively small quantities of oil and gas which are then diverted through various testing devices.) The two men were alerted by an audible gas detection alarm located on the platform's upper level. The men turned off the water used for cleaning and made their way to the living quarters on the level above them. As both men entered the living quarters, they detected an odor attributed to gas. They propped open the quarters door and proceeded toward the galley. When the first man reached the galley door, an explosion occurred behind him. A fire immediately erupted, and he escaped the burning structure by exiting through the galley door. After recovering from the initial shock, he made an attempt to locate his colleague, but due to the extreme intensity of the heat, he was unable to approach the building. After failing to locate his companion, he crossed to the other side of the platform to activate the Emergency Shutdown Device (ESD), located next to the down stairway. This device caused the gas coming from the wells into the compressors and test separating units to be shut off, thereby eliminating an additional source of fuel for the fire. While activating the ESD, a second explosion occurred in the living quarters. The man descended to the 12-foot level and lay down on the grating. He then fell

The intensity of the explosion and fire caused this damage to the generator wall facing the living quarters. (All photos are from U.S. Coast Guard files)

Mr. Pettin is a program analyst with the Marine Safety Evaluation Branch, Marine Investigation Division, Office of Merchant Marine Safety, U.S. Coast Guard.

asleep or lost consciousness, most probably as the result of shock induced by burns received in the initial explosion and fire.

Sometime later, the man was awakened by a third explosion, and he decided the safest place to be was in the water. Wearing a personal flotation device, he descended the leg ladder, entered the water, and remained there for about 30 minutes until deciding to reboard the platform to try and launch the platform's 28-man Whittaker Survival Capsule. He lowered the capsule by means of the brake lever on the winch, as the primary releasing mechanism was fouled with debris from the explosions, and he feared damage to the launching cable. When the capsule was safely in the water, the man descended the ladder, reentered the water, and climbed into the capsule. He was unable to release the capsule from its launching cable because of burns sustained to his hands, and it remained tethered to the platform. After locating the signaling equipment inside the capsule, he fired several aerial flares.

The crew of an offshore supply vessel (OSV) operating in the vicinity spotted the fire aboard the platform and radioed the U.S. Coast Guard Group in Galveston, Texas. The OSV crew then proceeded to the platform and rescued the man from the capsule, but they were unable to locate the second worker in their search of the platform. The lone survivor was air-lifted to Galveston for treatment of severe burns to 30 percent of his body. The following day, the remains of the missing worker were found in the inside doorway of the quarters. The quarters building had almost been completely destroyed by explosions and fire.

Casualty Analysis

Subsequent investigation into the casualty revealed that the drain piping system leading from the sub-deck to the common drain sump was not equipped in any way to prevent the upward migration of gases or vapors to the upper levels of the platform. When GETTY OIL WEST CAMERON 405-A was constructed, both the living quarters and the generator shelter were positioned over open deck drains which led to the drain sump. The bases of these structures were attached to the deck in such a manner as to prevent ventilation of the space between the flooring and the deck.

The most probable cause of this casualty was the contamination of the living quarters unit and generator shelter with flammable gases or vapors which migrated from the platform's common drain sump, through the common drainage system, and into spaces beneath the quarters unit and generator shelter. The gas was then ignited from an undetermined source. The source of ignition could not be adequately determined due to the degree of damage to the living quarters and associated equipment, although the most probable source of ignition was an electrical spark or discharge originating from the switch contact of the air conditioning or heating equipment located in the living quarters. It is unknown if the opening of the galley door contributed to the explosion by allowing vapors to come into contact with the ignition source.

The U.S. Coast Guard investigating officer reported that, during the attempted evacuation, the releasing mechanism on the Whittaker Survival Capsule failed to release the capsule from its launching cable. Close examination of the releasing mechanism revealed possible disuse and some minor corrosion to the come-along, the mechanism that rotates the hook and releases the capsule from its launching cable. The investigating officer stated in his report that a stronger spring on the take-up reel pawl would have allowed the come-along on the releasing mechanism to operate properly, and release the launching cable.

Regulatory Developments

The Outer Continental Shelf Lands Act Amendments of 1978 states that the Coast Guard or the Secretary of the Interior, individually or jointly, if they so agree, shall promulgate regulations to provide for scheduled onsite inspection, at least once a year, of each facility on the OCS. Inspection shall be made for all safety equipment designed to prevent or ameliorate blowouts, fires, spillages, or other major accidents. These inspections may be made without advance notice to the operator of such facility to assure compliance. The act does not require the Coast Guard to perform these inspections itself but only to "provide for" them by means of regulations. Due to the magnitude of conducting both annual and periodic inspections of all fixed facilities on the OCS, the Coast Guard is considering requiring that annual inspections of fixed facilities be conducted by the facility owner's personnel or by a third party employed by the owner. Under this program the owner would certify to the U.S. Coast Guard that the inspection was performed, that all discrepanices were corrected, and that the facility was in compliance with the regulations.

The efforts of Coast Guard inspectors could then be focused on unannounced inspections of the fixed facilities, particularly on those which are manned or which have a poor safety record. These inspections by the Coast Guard could, in turn, provide a means for monitoring the application and effectiveness of the "self-certification" program. This program was proposed in an Advance Notice of Proposed Rulemaking (ANPRM) published in the Federal Register on March 14, 1985, and comments were solicited. Industry response to this notice has been heavy. Comments are being evaluated and will be considered during the development of proposed rules.

Many of today's large platforms house production facilities capable of handling thousands of barrels of oil and millions of cubic feet of gas daily. There are no provisions for structural fire protection to allow for the escape of persons working on platforms. There are no provisions for fire protection of living areas, no required fire control measures, and no required personnel protection equipment. In the ANPRM of March 14, 1985, the Coast Guard solicited comments with regard to the adequacy of current Coast Guard regulations relative to fire detection, firefighting, and structural fire protection to fixed facilities. These comments will also be considered during the development of proposed rules.

A major concern of the U.S. Coast Guard is in the area of safe evacuation of personnel working on the OCS. The Coast Guard is currently trying to determine the role of standby vessels in an overall evacuation plan. Current regulations for evacuation and lifesaving for personnel working on platforms are essentially unchanged from the original regulations published in 1956 (CGFR 56-4, 21 FR 903, February 9, 1956). These regulations state that all manned platforms be provided with at least two approved life floats. The life floats must have sufficient capacity to accommodate all persons present at any one time and must be distributed in accessible locations. The life floats must be mounted on the outboard sides of the working platform in such a manner as to be readily launched. Approved lifeboats, approved liferafts, or approved inflatable liferafts may be used in lieu of approved life floats. Many companies have responded to the obvious need for improved means of escape by substituting covered lifeboats (escape capsules) for required life floats. Additionally, standby vessels stationed close to platforms have been used to augment the evacuation and lifesaving equipment on board production platforms. On October 4, 1984, and November 12, 1985, the House Subcommittee on the Panama Canal and the Outer Continental Shelf held hearings on proposed bills which would require the Coast Guard to issue regulations requiring standby vessels. The Coast Guard is studying the relationship between standby vessels and the facility's primary lifesaving equipment to determine whether and to what degree standby vessels would be mandatory. In this respect, the Coast Guard is addressing the following items:

A portion of the helo deck was blown into the life capsule support frame by the explosion.

- the distance a standby vessel should maintain near a platform in order to render effective assistance in an emergency,
- the design criteria a standby vessel should meet,
- special equipment that should be aboard standby vessels for effective handling of emergencies,
- how a standby vessel should be named, and
- the special training that should be required of a standby vessel's crew.

A Lesson Learned

This accident illustrates the need for improving safety on the Outer Continental Shelf. Whenever one overlooks safety, whether in design or in the workplace, one runs the risk of tragedy. Many times disaster can be avoided, but there is always the chance that a combination of events will culminate and produce a tragedy.

The gauge board inside the generator room bears mute witness to the fire's severity.

The drainage system on a platform can provide a hazardous path for the migration of natural gas. Owners, operators, and safety inspectors (industry and Coast Guard) should be highly aware of this potential. From the safety standpoint, buildings should not be placed over existing drains, and drains should not be installed under buildings. If the Coast Guard encounters this particular situation during an inspection of the platform and determines the condition to be hazardous, the drains should be ordered removed or plugged. The present system can be made safer. Standard plumbing "P" traps should not be installed in drains under buildings where they tend to fill up with dirt. The American Petroleum Institute states in API RP 14E that consideration should be given to minimizing bends and flow restrictions in gravity drains and in no circumstances should upslopes be permitted.

In the event of an emergency, all electricity should be turned off, with the exception of emergency explosion-proof lighting, and the platform shut down. In the event a gas detection alarm is triggered, employees should be directed to stay out of buildings until the source of gas or flammable vapor can be identified and eliminated by safe means. Assigned personnel are required, by 33 CFR 146.15, to thoroughly inspect all lifesaving equipment periodically, making sure that all equipment is in good working order. This includes operating it as necessary. Good operating practices require replacement of expended equipment, as well as periodic renewal of those items which have a limited period of effectiveness. In addition, 33 CFR 146.125 requires drills to be conducted on a regular basis by the person in charge of the manned facility. This individual shall instruct personnel as necessary to ensure that all persons are familiar with their duties and stations.

Fixed platforms on the Outer Continental Shelf play an important role in the energy resources of the United States, as well as provide economic opportunity for the local communities. Safety on board fixed platforms can be improved through close cooperation with the oil industry.

This article was based on the report of the Investigating Officer, Marine Safety Office, Port Arthur, Texas. The report number is MC85000838, dated April 23, 1985.

The ONDEK Vapor Dispersion Model

Robert H. Trainor
Michael C. Parnarouskis
LCDR Rex J. Prosser

One of the marine transport industry's important functions is the transportation of bulk liquid products in tankers and barges. These bulk liquid cargoes include pure chemicals, gasoline, crude oil, and other common chemical and petrochemical products. More than 600 substances are regulated for marine transport by the U.S. Coast Guard under Title 46 of the Code of Federal Regulations.

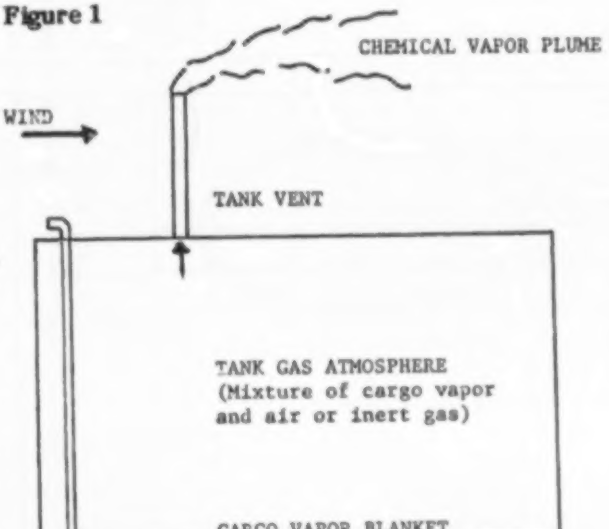
The toxicity of bulk liquid cargoes ranges from substances with negligible toxicity, such as edible vegetable oils, to highly toxic substances, such as carcinogens. Many of the cargoes are liquid organic solvents which tend to have significant vapor pressures, and therefore significant potential for being respiratory hazards at ordinary temperatures.

Marine transport personnel who handle these bulk liquid cargoes risk exposure to toxic vapors when performing their normal work. The Coast Guard saw the need to develop an analytical model which would predict the downwind concentration contours of heavier-than-air cargo vapors emitted during tank loading operations, and then graphically represent potentially hazardous areas. This analytical model is referred to as ONDEK.

Dispersion of Chemical Vapor Plumes

Chemical vapors are released during loading at or above deck level by the displacement of the ullage atmosphere in an empty tank. During the loading of a chemical cargo, the chemical will evaporate at the liquid-gas boundary in the tank to form a "vapor blanket" above the liquid surface. The chemical vapor moves away from the liquid surface and mixes with the air or other gases initially inside the tank. As the liquid level rises, this mixture of air, initial gases, and cargo vapor is displaced from the tank as shown in figure 1. This displacement can be through a vent, ullage hatch, or expansion trunk opening. Once released into the atmosphere, the cargo vapors mix with the air and begin to spread out from the vent or discharge point. As the cargo vapors move downwind of the discharge point, they become more dilute in the air. Since most

Figure 1



The authors of this article are chemical engineers and industrial hygienists in the Hazardous Materials Branch, Marine Technical and Hazardous Materials Division, U.S. Coast Guard.

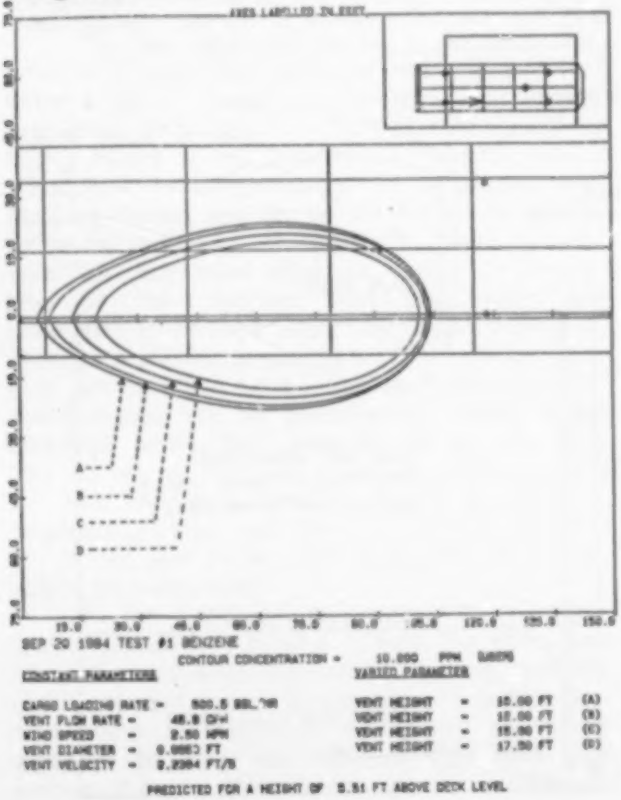
cargo vapors are heavier than air, the cargo vapors will also sink to deck level.

The relative vapor hazards on deck can be determined by estimating the size of the cargo vapor contour at a given concentration over the deck area of the vessel. The ONDEK model can compute the size of the cargo vapor contour and superimpose a plot of the computed contour over a schematic outline of the vessel. At locations within the vapor contour, the vapor concentrations will be higher than the contour concentration value. Likewise, at locations outside of the vapor contour, vapor concentrations will be more dilute than the contour concentration value. Figures 2 through 5 are examples of the different types of concentration plots that the ONDEK model can produce.

Applications

Since the ONDEK model is designed to compute estimated vapor concentrations downwind of a tank vent during tank loading operations, these vapor concentrations can be expressed in terms of health-significant limits for the chemical vapor being emitted. Values for vapor exposure limits, such as the time weighted average-threshold limit value (TWA-TLV), the short term exposure limit (STEL), and the upper and lower flammable limits (UEL and LEL) can be used as input concentration values for ONDEK. The plots of the concentration contours superimposed over a schematic outline of the vessel illustrate how much of a vapor inhalation hazard exists for personnel working on the barge or tank ship during loading operations. Since ONDEK permits the user to designate the concentration and the specific chemical vapor, the model is a very useful tool for conducting vapor hazard assessment studies of marine cargo transfer operations.

Figure 2



The model can also be used to predict the downwind concentrations of vapors released by accident, such as might occur when a vapor transfer line ruptures or a vapor release valve malfunctions. The predicted concentrations will be useful in formulating response plans and conducting casualty investigations. ONDEK model results were recently used in a major marine casualty investigation to determine whether a flammable vapor mixture was emitted from an open vent and ignited by a source some distance downwind.

Perhaps the most useful application of the ONDEK model is how easily it lends itself to showing how conditions, such as cargo loading rate, vent height and diameter, and wind speed, can increase or decrease the size of a concentration contour.

As an example, the ONDEK model was used to predict the effects of raising the vent heights for 21 test chemicals. The ONDEK tests indicated that increasing vent heights has only a minimal effect on reducing exposure levels. The size of the concentration contours were far more sensitive to wind speed and cargo loading rate. Figures 2, 3, and 4 are contour plots for benzene which were obtained during this study and demonstrate these findings.

The model can also plot multiple concentration contours on a single plot. Figure 5 is a sample plot for benzene. The results indicate that the size of the concentration contour is very sensitive to the concentration value selected. Consequently, determination of the appropriate exposure level standard for employees working in these areas is extremely important.

Summary

The ONDEK vapor dispersion model was designed to predict concentrations of vapor released from a bulk liquid cargo tank during cargo transfer operations, and thereby provide a measure of the hazardous vapors to which marine industry employees are exposed. The model was developed as part of the Coast Guard's ongoing occupational health and safety program.

A copy of the ONDEK program will be provided upon written request. Interested parties should supply a blank tape and foward their requests to Commandant (G-MTH-1), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593.

Figure 3

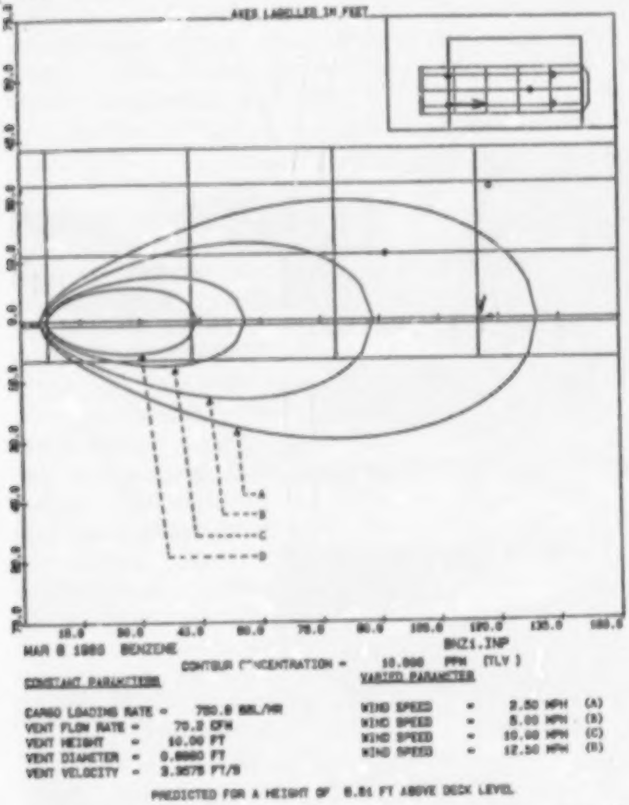


Figure 4

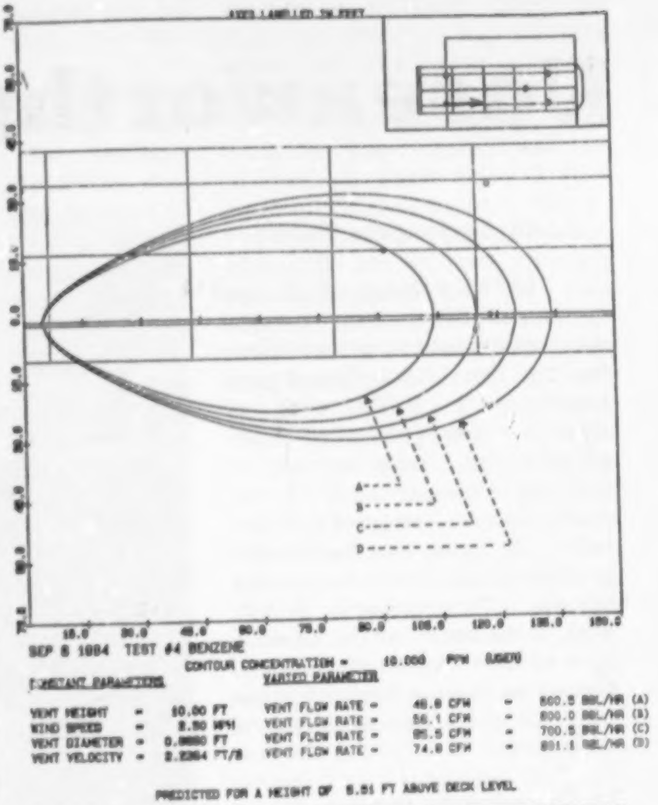
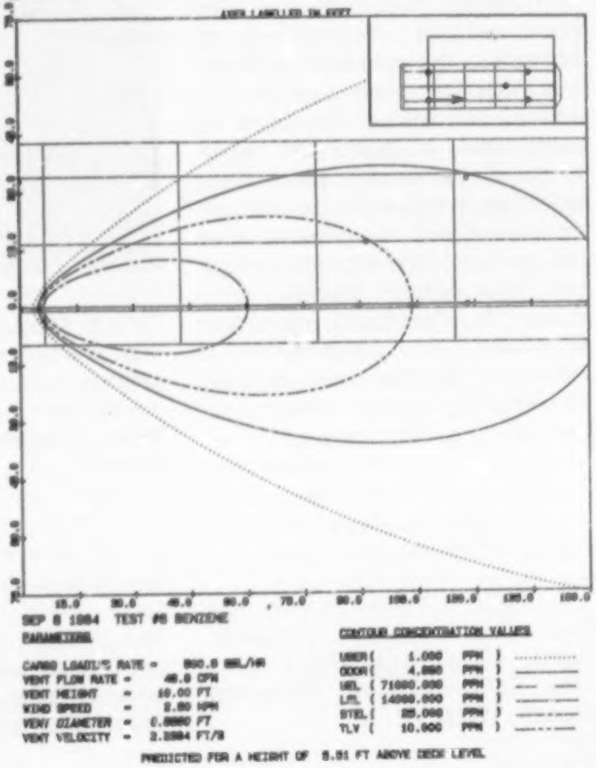


Figure 5



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Astleford, W.J., et al., *Investigation of the Hazards Posed by Chemical Vapors Released in Marine Operations — Phase II.* San Antonio, TX: Southwest Research Institute, April 1985. (Available through the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.)

Control Data Systems, Inc., *VAX ONDEK 84 System Documentation.* Rockville, MD: Contract W6903-08G, March 1985. (Available through Commandant (G-MTH-1), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593.)

Unseaworthy Barges

LCDR Christopher Walter

In the evening of 10 December 1984, a barge which was not inspected or certificated by the Coast Guard was loaded with 1,600 tons of liquid fertilizer and pushed out of Hampton Roads enroute to Seaford, Delaware, via Chesapeake Bay. Thirty-two hours later, the crew was desperately trying to keep the barge afloat. Their efforts failed. This is the story of the casualty and the standard of care placed on towing vessel operators for the seaworthiness of their tows.

An Unseaworthy Barge

When the tug and its crew arrived at the loading terminal, the captain noticed that the barge was low in the water. He told a deckhand to pump out a starboard wing tank. Water continued to flow into the wing tank as it was being pumped. The owner and the captain decided to patch this hole before leaving Norfolk. The deckhands placed a sheet of foam rubber over the hole, and the foam rubber was covered by plywood which was braced by a 2x4-inch piece of lumber. The owner provided a 2-ton jack to hold this makeshift repair in place and assisted in making the repair.

"When the barge was lifted on the drydock, water poured out of the starboard side in four places." (Official U.S. Coast Guard photo)

Were Appropriate Repairs Made?

The barge was drydocked in mid-November 1984, just weeks before the casualty, for some "band-aid"-type repairs. The barge was then placed back into service and made several trips from the Hampton Roads area. On the trip just prior to the 10 December voyage, the barge was holed, and water leaked into a wing tank. The same captain had to pump out the wing tank to keep this 21-year-old barge afloat.

The Voyage

The tug pushed the barge

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away from the fertilizer dock at 1800 on 10 December 1984. The flotilla passed through five bridges and crossed over three highway traffic tunnels on its way out of Norfolk and into Chesapeake Bay. While still in the Elizabeth River, the mate for the voyage boarded the tug and asked the captain about the water being pumped over the side. The captain said the barge was sinking, and he made numerous complaints about the company. The mate discounted these complaints and inquired no further into the barge's condition.

When the mate went on watch at noon the next day, the captain told him to keep an eye on the barge's stern cleat and to call him if the bottom of the cleat went underwater. About an hour later, the captain retuned to the pilothouse and told the mate that the barge was sinking and pulling the tug underwater. He ordered the mate and the deckhands to pump out the barge. When the towing cables were slacked to ease the submerging force of the barge, the starboard deck of the barge immediately went underwater for about two-thirds of its 195-foot length. The men on the barge couldn't pump the starboard side, so they pumped out a stern compartment. Despite their efforts, the barge continued to sink. The towlines were slacked again, and water began to flood into the open stern compartment manhole. The barge was put on a hawser and intentionally grounded to keep it from sinking.

The crew put lights on the barge and stood by until another barge offloaded the cargo and salvage operations were started. The grounded barge was taken to Norfolk for drydocking and survey. When the barge was lifted on the drydock, water poured out of the starboard side in four places.

Two marine surveyors examined the underwater body of the barge for damage caused by the grounding and for any pre-existing deterioration. One of the surveyors took a small inspection hammer and pushed it by hand through the hull at the bilge turn and, with very little effort, ripped open a 12-inch hole. The surveyors determined that he hull deterioration had been present for quite some time and that the grounding and subsequent salvage effort had not caused this damage.

Seaworthiness

After investigating the casualty, the Coast Guard Investigating Officer charged the tug captain under the provisions of Title 46 United States Code (U.S.C.) 7703 for misconduct, i.e., taking an unseaworthy vessel to sea in violation of 46 U.S.C. 10908.

46 U.S.C. 10908 states

> *A person that knowingly sends or attempts to send, or that is a party to sending or attempting to send, a vessel of the United States to sea, in an unseaworthy state that is likely to endanger the life of an individual, shall be fined not more than $1,000, imprisoned for not more than 5 years, or both.*

During the suspension and revocation hearing in Norfoilk, two elements of the offense had to be proved. The first element was to prove that the barge was unseaworthy. The second dealt with proving a knowing violation; that is, did the tug captain know that the barge was unseaworthy?

"Seaworthiness, as that term has been defned and redefined, is reasonable fitness to perform or do the work at hand."[1] The seaworthiness element was proved through the testimony of the two marine surveyors who examined the underwater body of the barge after it was salvaged. In their expert opinions, the barge was not seaworthy at the time of their survey, had not been seaworthy for some time, and the deterioration they had observed was not caused by any sinking, grounding, or salvage effort. Their opinions were based upon the extensive hull corrosion, the presence of widespread and undisturbed marine growth on the underwater body, and the lack of any "bright" metal that would indicate a recent penetration of the hull from a grounding. The testimony of a crew member about the holed condition of the wing tank and the need to pump the barge before and after the casualty was also used. Also, in other cases it has been held that "when there is a sinking of the barge as this barge did with no apparent reason in normal use, there is a presumption that it is unseaworthy..."[2] The respondent was unable to overcome either the presumption of unseaworthiness or the testimony provided by the marine surveyors and the deckhand.

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[1] *Lamar Towing, Inc.* **v.** *Fireman's Fund Insurance Company, 1973 AMC 1844, 1855, 352 F. Supp. 652, 661.*

[2] *Consolidated Grain & Barge Company* **v.** *Marcona Conveyor Corporation, et al., 1985 AMC 121, 716 F. 2d 1077.*

Did The Operator Know?

The proof of knowledge was more difficult. The master of a vessel is responsible for knowing the condition of his vessel. However, is a towing vessel operator responsible for knowing the condition of each barge he undertakes to tow? That question played an important role since the charge would have been dismissed if the operator was not required or did not know about the barge's condition. In this case, the operator did know and should have known of the barge's condition. First, he had pushed the barge previously and had to pump it to keep it afloat. Prior to departing the fertilizer terminal, he had ample opportunity to examine most of the barge's hull before it was loaded. He directed his crew to pump out a wing tank. Later, his entire crew, along with the owner of the barge, was engaged in patching a hole in one wing tank. In addition, he gave operational orders to the mate to call him if the stern cleat on the deck of the barge went under. Clearly, the operator knew that the barge was not seaworthy.

Standard of Care for Towing Vessel Operators

The Administrative Law Judge addressed the issue of the respondent's knowledge of the barge's condition as well as a standard of care to be followed by tug operators with regard to their tows when he wrote the following in his Decision and Order:

> *The testimony indicates that neither the respondent nor any other reasonable operator would conduct an underwater inspection of a barge he intended to take to sea. He is, however, required to exercise reasonable judgment as to whether the barge is in a seaworthy condition. In this case, the respondent knew or should have known that one of the void tanks was leaking and that the owner had undertaken to patch the hole with foam rubber, plywood, and a jack. Secondly, the respondent was not unfamiliar with the barge and was aware that on a previous trip a short time ago the bottom was holed while dragging bottom.*

The Administrative Law Judge suspended the tug operator's license outright for a period of 9 months.

Summary

No one was killed in this casualty only through a combination of circumstances and luck. Tug operators must take seriously the responsibility placed upon them and exercise reasonable caution regarding the seaworthiness of their tows.

The importance of ensuring that a barge is seaworthy is illustrated in another casualty which ended in tragedy. Less than a month before this case, on 17 November 1984, the M/V CELTIC was towing the uninspected barge CAPE RACE in Long Island Sound when the barge suddenly sank. The tug was pulled down by the barge, and all six crew members died. The National Transportation Safety Board's detemination of the cause of this casualty perfectly summarizes the problem:

> *...the probable cause of the sinking of the tug CELTIC and barge CAPE RACE was the failure of the owner of the barge to maintain the barge adequately, which allowed the internal structure and shell plating of the barge to deteriorate until the barge sustained a hull fracture, resulting in the flooding of the forward part of the barge, causing the barge to plunge underwater bow first and sink. The tug was pulled underwater by the sinking barge.*[3]

Editor's Note: The owner's responsibility with regard to the sinking of the unidentified barge is currently under investigation by the Coast Guard Marine Safety Office, Hampton Roads, Virginia. The Coast Guard encourages mariners to report defects in a vessel, such as the one highlighted in this article, by calling the 24-hour, toll-free hotline, 1-800-323-SAFE.

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[3] *Marine Accident Report, Sinking of the U.S. Tug M/V CELTIC and Barge CAPE RACE, Long Island Sound, Connecticut, November 17, 1984, Report No. NTSB/MAR-85/12, National Transportation Safety Board, Washington, DC, 1985, p. i.*

Yost Takes the Helm

ADM Paul A. Yost, Jr., is scheduled to be sworn in as the eighteenth Commandant of the Coast Guard on May 30, 1986. He succeeds ADM James S. Gracey, who is retiring after 37 years of service. The ceremony will be held at the Washington Navy Yard, Washington, DC.

Prior to being appointed Commandant, ADM Yost had been Commander of the Atlantic Area; Commander, Maritime Defense Zone Atlantic; and Commander, Third Coast Guard District since June 1984. In these capacities he was responsible for Coast Guard operations in the Atlantic, Caribbean, and the Gulf of Mexico. As Commander Maritime Defense Zone, he was responsible to Commander Atlantic Fleet for full use of all available Coast Guard and Navy assets for maritime coastal defense. Prior to this assignment, he was Chief of Staff of the Coast Guard in Washington, DC, for 3 years after having served as Commander, Eighth Coast Guard District, in New Orleans, Louisiana, since 1978, when he ws promoted to Flag Rank.

ADM Yost has held a wide range of key management and operational positions, including Chief of Staff and Chief of Operations of the Seventeenth Coast Guard District in Alaska and Commander of a combat task group in Vietnam. He has had command of three Coast Guard cutters, and he has served as a Special Assistant to the Deputy Secretary of Transportation and Alternate Delegate on the U.S. Law of the Sea Delegation.

A native of St. Petersburg, Florida, ADM Yost holds a Bachelor of Science Degree from the Coast Guard Academy, a Master of Science Degree in Mechanical Engineering from the University of Connecticut, and a Master of Arts Degree in International Affairs from George Washington University. ADM Yost is also a graduate of the U.S. Naval War College in Newport, Rhode Island.

He is married to the former Jan Worth of Wakefield, Massachussetts. Mrs. Yost is a graduate of the University of Maryland with a degree in Communications and Journalism. They have five children: Linda L., Paul A. III, David J., Lisa J., and Christopher J.

ADM Paul A. Yost, Jr.

Limitations of Exposure Suits

LCDR William M. Riley

A recent study by the Commander, Seventeenth Coast Guard District, found an alarming number of deaths occurred in fishing vessel capsizings and sinkings in Alaskan waters, in spite of the availability of exposure suits. The District Commander's report concluded that more public education is needed to ensure that the suits are properly maintained, readily accessible, and that the crew knows when and how to use them to best effect.

The most common problem noted in the District Commander's study was a person becoming trapped in the pilothouse or cabin of a fishing vessel when the boat capsized or sank. In three of the cases studied, crewmen were either in the process of donning an exposure suit before exiting the pilothouse, or were reentering a cabin to get an exposure suit, when they became trapped. In the one other case, a crewman was eventually found trapped in the engine room of the vessel, wearing an exposure suit. It is impossible to say whether any of these victims could have found their way out of the submerged, inverted compartment, even unencumbered by the exposure suit with its inherent buoyancy. The kind of emergency egress training needed to survive such a situation has traditionally only been available to military aircrews, although some offshore oil industry workers have now started to receive similar training. It is good advice, therefore, to get to an open deck whenever the vessel is in distress, and to don your exposure suit only after you are in the open. Of course, the suits should be stowed where they are readily accessible on the way out.

In two cases, crew members were found floating face down wearing exposure suits, in each case with head injuries which probably rendered them unconscious immediately. In at least one other case a crewman, wearing an exposure suit, was caught in the rigging and pulled under, never to be seen again. A person wearing an exposure suit is less likely to be rendered unconscious from hypothermia, leading to drowning, but being struck by the vessel's hull, superstructure, or rigging may bring immediate unconsciousness and eventual death. Exposure suits will not turn an unconscious wearer face up in the water, and wave action will periodically turn even a conscious wearer face down. You must remain conscious to survive. One way to increase your chances of survival is by early abandonment into a liferaft or boat which then gets clear of the distressed vessel's rigging. In most capsizing and sinking cases, there was some foreknowledge that the vessel was taking on water and in trouble; a distress call was made; but the crew waited until the vessel finally rolled over or sank before abandoning. The decision to abandon ship is always a hard one, but once a distress call has been made and help is on the way, abandonment to the safety of a liferaft, standing off a safe distance from the sinking vessel, must be seriously considered to avoid being trapped. Just be sure to include this intention in your distress message.

The victims of the cases studied did the best they could to save themselves. "Monday morning quarterbacks" can always find something to criticize, but fixing blame should not be our goal. Rather, we should learn from past casualties anything which might help us minimize future deaths and injuries.

LCDR William M. Riley is a Staff Engineer in the Coast Guard's Survival Systems Branch, Merchant Vessel Inspection Division, Office of Merchant Marine Safety, U.S. Coast Guard Headquarters.

Medical Emergencies at Sea

Here in one place the yachtsman will find a comprehensive, up-to-date, informative manual on how to recognize and treat medical emergencies on board a boat. Dr. William Kessler, the author, concerns himself with emergencies and with the prevention and treatment of such seagoing calamities as sunburn, seasickness, hypothermia, dehydration, broken bones, heart attacks, severe cuts and punctures, and drowning.

The book utilizes the latest research, compiled by a doctor who has been practicing medicine and sailing for more than 25 years. His specific purpose in writing the book was to instruct the yachtsman at sea on how to handle medical problems when a doctor or hospital is hours, or even days, away. Dr. Kessler's step-by-step instructions and detailed illustrations make the book invaluable, and his advice about which drugs and other treatments will work and which won't strkes a fine balance between old wives' tales and solid medical consultation.

Chapters on burns, venomous marine animals, fractures, and head and spinal cord injuries fill out this readable, thought-provoking, and concise guide.

Copies of **Medical Emergencies at Sea** may be ordered from Hearst Marine Books, 105 Madison Avenue, New York, NY 10016. The price is $18.95.

Study Guide

Another volume in the Cornell Maritime Press series of study guides for professional mariners has been published. It is the **Study Guide to the Multiple-Choice Examinations for Lifeboatman and Able Seamean,** by William B. Hayler (Capt., USN, Ret.) and Paul M. Seiler (Chief Warrant Boatswain, USCG, Ret.). Both authors are on the faculty of the California Maritime Academy.

Containing more than 600 multiple-choice questions and answers, the book is designed to help young mariners prepare for the Coast Guard examinations. Divided into separate sections for each rating, the questions cover all areas from which the Coast Guard chooses subject questions. Some of the topics covered are emergency and lifesaving signals, regulations, davits, lifeboats, rules of the road, helicopter operations, and nautical terms.

The sources of this compilation are varied: candidates who have recently sat for the test were queried; approved textbooks and the Code of Federal Regulations were consulted, and finally, the authors relied on their own experience and backgrounds in developing questions in areas not sufficiently covered by other means.

This book is priced at $12.50 and is available from Cornell Maritime Press, Box 456, Centreville, Maryland 21617.

Maritime Affairs-- A World Handbook

The world's oceans and seas cover about 71 percent of the earth's surface, yet only in the last few decades has a major effort been undertaken to explore and understand the role of the sea in the life of mankind.

Maritime Affairs — A World Handbook (412 pp.) covers a wide range of subjects relating to oceans and seas, including international maritime law, sea transport and communications, the exploitation and conservation of marine natural resources, scientific research, boundary disputes, and the military dimension of the sea.

The text of the book provides up-to-date data on each subject area covered. In addition, there are directory sections giving descriptions, names, and addresses for major international maritime organizations, major organizations for each subject, and maritime publications arranged by subject and by country.

An appendix furnishes the full text of the United Nations Law of the Sea Convention, and the subject-arranged bibliography cites appropriate books for further reading. Completing the work is a detailed index. Order from Gale Research Co., Book Tower, Detroit, Michigan 48226; price $90.00.

MARAD Reports

The Maritime Administration has announced the availability of three technical research

continued on page 142

Coast Guard Awards Presented to Civilians

Distinguished Public Service Award

In March 1986, RADM Theodore Wojnar, on behalf of ADM James S. Gracey, presented the Coast Guard Distinguished Public Service Award to Gordon W. Paulsen, admiralty lawyer with the firm of Healy and Baillie in New York City, and past president of the Maritime Law Association of the United States. This honor is the highest recognition of its kind the Coast Guard may award a civilian.

Paulsen was cited for his extraordinary efforts in support of the Coast Guard while serving as Chairman of the Rules of the Road Advisory Council from 1982-85. According to the citation, Paulsen displayed exceptional leadership ability and professional knowledge which was responsible for the Council's successfully accomplishing numerous major initiatives which have improved navigation safety.

Gordon W. Paulsen accepts the Distinguished Public Service Award from RADM Wojnar.

Meritorious Public Service Award

RADM Wojnar also presented the Coast Guard Meritorious Public Service Award to Captain Charles F. Lehman, Vice President, American Commercial Barge Line, on behalf of ADM James S. Gracey. This honor is the second highest recognition of its kind the Coast Guard may award a civilian.

Captain Lehman was cited for his contributions to the Coast Guard while serving as Vice-Chairman of the Rules of the Road Advisory Council from 1982-85. According to the citation, Captain Lehman distinguished himself while serving as the Chairman of the Barge Sidelight Working Group and Rule 24 Working Groups. He continuously provided invaluable experience and knowledge while serving as a member of other Council working groups.

RADM Wojnar affixes the silver Meritorious Service Award medal to Captain Lehman's lapel.

Public Service Commendations

Ms. Georgia Volakis, Program Coordinator for the American Waterways Operators, accepts the Public Service Commendation Award from ADM James Gracey as Mr. Joseph A. Farrell, AWO President, looks on. Mr. John Rivers, Vice President and Secretary, accepted for the Shipbuilders Council of America. (The third award, made to Mr. George J. Ryan, President Lake Carriers Association, by RADM A.M. Danielson, Commander of the Ninth Coast Guard District, is not pictured.) These awards were made to honor over 90 years of combined service in providing Coast Guard officers with Merchant Marine Industry Training.

From left: Mr. Joseph Farrell, Ms. Georgia Volakis, and ADM Gracey.

Mr. John Rivers and ADM Gracey.

Keynotes

Final Rule

CGD 85-057, Private Aids to Navigation (April 3)

The Coast Guard is amending the private aids to navigation regulation. Currently, electronic private aids to navigation, with the exception of shore-based radar systems, are prohibited (33 CFR 66.01(d)). Requests from the offshore industry, and favorable experience with radar beacons (racons) as federal aids to navigation have caused the Coast Guard to recognize the desirability of allowing racon use as private aids to navigation. This rule will provide that racons are excepted from the general prohibition against electronic private aids to navigation. This regulation becomes effective on May 5, 1986.

CGD 85-048a and CGD 85-048b, Coast Guard Plan Review; Change of Address for Submission of Plans (April 24)

These rules change the address for submitting vessel plans for Coast Guard review. The plan review duties previously performed by the Merchant Marine Technical Branches of the Third Coast Guard District in New York, New York, the Eighth Coast Guard District in New Orleans, Louisiana, and the Twelfth Coast Guard District in Alameda, California, are being assumed by the Marine Safety Center located in Washington, DC. The effective date is June 1, 1986.

Supplemental Notice of Proposed Rulemaking

CGD 81-057, General Bridge Permit Program Regulations (24 April)

This proposed rule would establish a General Bridge Permit and the procedure for receiving authorization to proceed with the construction or modification of bridges under the Permit. The General Bridge Permit Program would eliminate the unnecessary burdens under the present program, while maintaining an adequate level of review of navigational and environmental concerns by the Coast Guard. Comments must be received on or before June 23, 1986.

continued on page 141

New Federal Regulations--Oily Waste Reception Facilities

LT G.M. Jacobson

Oily waste reception facilities. Certificates of Adequacy. MARPOL 73/78-Annex I. COA Worksheet.

If these terms are new to you, two workshops held in December 1985 by Captain of the Port New York may have interested you, particularly if you operate a terminal that receives oceangoing vessels. On December 3 and 10, 130 individuals from the New York/New Jersey maritime community went to Governors Island to review new U.S. regulations. Of the 292 terminals within the port, currently 130 of these are affected by the new regulations. At the workshops, the terms above and the regulations in Title 33, Code of Federal Regulations, Parts 151 and 158 (33 CFR 151 and 158) were studied and discussed.

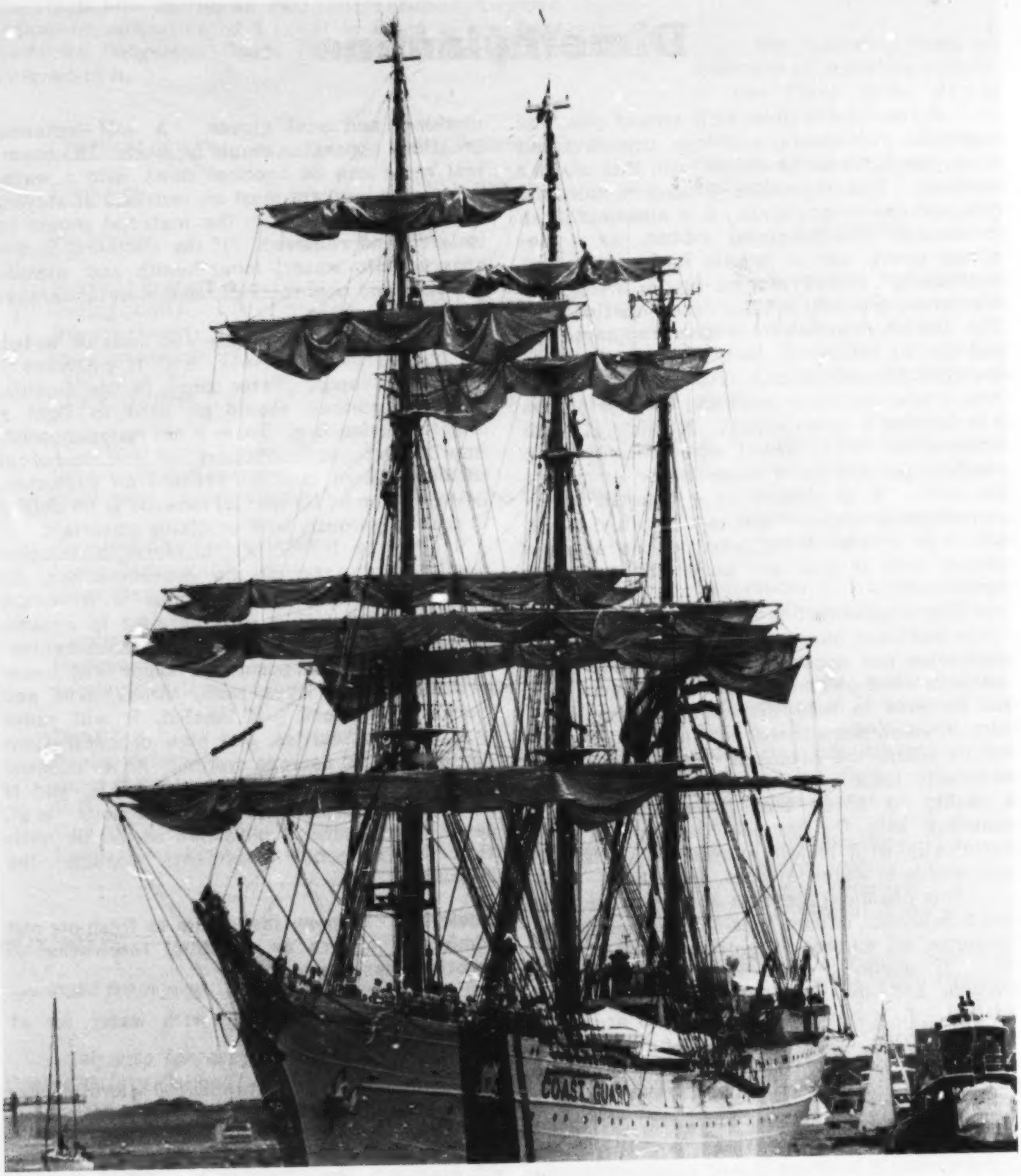
Commencing 10 March 1986, all terminals that receive oceangoing vessels over 400 gross tons and oceangoing tank vessels of all sizes will have to provide a service of receiving oily wastes from those ships. Their terminal can receive the waste, or they can have an outside vendor come to the terminal to receive the waste. This service for the ships is intended to help reduce the pollution of our oceans. The maritime countries of the world, through the international agreement known as MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978), established this and other standards of care to help stop pollution from ships.

The United States as a signatory nation to this international agreement (MARPOL 73/78) must ensure waste reception facilities are readily available and services do not delay the vessel's movements. To ensure this, the Department of Transportation, through the Coast Guard, promulgated regulations that establish the criteria for these waste facilities (33 CFR 151 and 158). The Coast Guard will be enforcing the regulations through the Captains of the Ports (COTPs). The COTP representatives will be inspecting the terminals to ensure their reception facility services for the ships are adequate in size and capability. After the inspections, the Coast Guard will be issuing Certificates of Adequacy as outlined in Commandant Instruction M16450.27.

LT Jacobson, U.S. Coast Guard, is assigned to the Captain of the Port, New York.

LTJG Jeff McCarthy discusses COTP enforcement authority for waste reception facility regulations.

The EAGLE Visits Washington



The U.S. Coast Guard Academy's training barque, the EAGLE, visited Washington, DC, on May 31 and June 1, 1986. The EAGLE was docked at the waterfront at 7th and Maine Streets in southwest Washington and was open to tours by the general public.

Larry R. Kennedy

Dimethylamine

If you take a good look around you, you might find that several everyday manufactured items you use were produced with this month's chemical. Dimethylamine is used in solvents, dyes, and pharmaceuticals. It is also used as an accelerator in vulcanizing rubber, as a dehairing agent, and in missile fuels and rocket propellants. Dimethylamine also attracts boll weevils and is useful in their extermination.

Dimethylamine's main uses are characterized by its ability to donate a lone pair of electrons (dimethylamine is a Lewis base) to form a new conjugate acid and conjugate base or in forming a Lewis adduct. It exists at room temperature (15°C and 1 atmospheres) as a colorless gas and has a dead-fish or ammonia-like odor. It is shipped as a liquefied compressed gas in cylinders and as a liquefied gas in bulk. It is also transported as an aqueous solution both in bulk and under the packaged regulations.

Dimethylamine is considered to be a stable chemical during transport. It does not polymerize and does not have hazardous reaction with most common materials. Tanks that will be used to hold the chemical should be made of steel, since it will not corrode. Copper and its alloys are attacked readily, and tanks made with these materials should not be used. It should be noted that dimethylamine will incandese with fluorine and decomposes exothermically with maleic anhydride. It is also very soluble in water, alcohol, and ethers.

This chemical presents dangerous fire and health hazards. In case of a spill or accidental discharge, all sources of ignition should be shut off. If possible, the discharge should be stopped, and the fire department should be notified. It is best to evacuate the area and restrict further access. Personnel can be protected from contamination by wearing chemical goggles with full face shield, rubber over-clothing, and acid gloves. A self-contained breathing apparatus should be worn. The chemical vapor can be knocked down with a water spray, and workers must be cautious of staying upwind of the vapor. The material should be isolated and removed. If the chemical is discharged into water, local health and wildlife officials and operators of nearby water intakes should be notified.

Dimethylamine floats and boils on water. Its boiling point is 44°F, and it produces a flammable vapor. Water spray, carbon dioxide, or dry chemicals should be used to fight a dimethylamine fire. Foam is not recommended. Any undamaged containers of the chemical should be kept cool to prevent an explosion. Beware: one of its special hazards is its ability to react vigorously with oxidizing materials.

Due to its ability to form a solution readily with water at low concentrations, dimethylamine may be dangerous if it enters water intakes. It is also harmful to aquatic life; however, there is no food chain concentration potential. Exposure to vapor will cause irritation to the eyes, nose, throat, skin, and mucus membranes. If inhaled, it will cause breathing difficulties, and high concentrations can affect the nervous system. As an aqueous solution, it will burn the eyes and skin, and if swallowed, it is assumed to be poisonous. In all cases of exposure, a physician should be notified. On-scene treatments include the following:

Inhalation. Remove the victim to fresh air and administer oxygen or artificial respiration if breathing has stopped.

Eyes. Flush continuously with water for at least 15 minutes.

Skin. Remove all contaminated clothing and shoes. The affected area should be flushed with water then washed with water and soap.

Swallowing. If conscious, the victim should drink water or milk.

The U.S. Coast Guard regulates both an-

Larry R. Kennedy was a Third-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

hydrous dimethylamine and aqueous solutions of dimethylamine under 46 CFR as Subchapter O commodities. Anhydrous dimethylamine is listed in 49 CFR 172.101 as a flammable gas and aqueous solutions of dimethylamine as a flammable liquid. Dimethylamine carries an IMO (International Maritime Organization) classification of 2.1. It is found in the International Maritime Dangerous Goods Code with a Hazard Class of 2 assigned to it.

Chemical name:	Dimethylamine
Formula:	$(CH_3)_2NH$
Synonyms:	DMA
Physical Properties:	
boiling point:	6.9°C (44.42°F)
freezing point:	-92.2°C (-134°F)
vapor pressure:	
20°C (68°F)	1900 mmHg
46°C (115°F)	2999 mmHg
Threshold Limit Values (TLV)	
time-weighted average:	10 ppm
short-term exposure limit:	20 ppm for 5 minutes
Flammability Limits in Air	
lower flammability limit:	2.8
upper flammability limit:	14.4
Combustion Properties	
flash point:	7°C (45°F)
autoignition temperature:	430°C (806°F)
Densities	
liquid (water=1):	0.6804
vapor (air=1):	1.55
U.N. Number:	1032
CHRIS Code:	DMA
Cargo compatibility group:	7 (Aliphatic Amines)

KEYNOTES

continued from page 137

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. In comparing two cams of the same diameter, one with tangential flanks and one with convex flanks, the cam having the tangential flanks will cause

A. greater valve lift.
B. more abrupt valve action.
C. less valve seat wear.
D. less valve gear wear.

Reference: Maleev, Diesel Engine Operation and Maintenance

2. Hydraulic system piping and equipment is designed and should be maintained to minimize turbulence in the hydraulic fluid because turbulence causes

A. fluid vibration.
B. energy losses.
C. erratic pressure.
D. mechanical damage.

Reference: Ladage, Stability and Trim for the Ship's Officer

3. The boiling temperature of a refrigerant with oil in solution has a

A. higher boiling temperature for a given pressure than does a pure refrigerant.

B. lower boiling temperature for a given pressure than does a pure refrigerant.
C. boiling pressure equal to that of a pure refrigerant at a given pressure.
D. lower boiling temperature than does a pure refrigerant, but the refrigerating effect is less.

Reference: King, Modern Marine Refrigeration Practice

4. What will be the frequency of a three-phase, six-pole, A.C. generator operating at 1800 revolutions per minute?

A. 60 hertz
B. 90 hertz
C. 120 hertz
D. 180 hertz

Reference: Hubert, Preventive Maintenance of Electrical Equipment

5. Most main reduction units employ double helical cut gears rather than single helical cut gears because they

A. eliminate the need for a turbine dummy piston.
B. eliminate the need for spherically seated bearings.
C. prevent unequal tooth contact.
D. prevent end thrust.

Reference: NAVPERS 10788-B, Principles of Naval Engineering

DECK

1. Which of the following would **not** be a treatment of a person who has received a head injury and is groggy or unconscious?

A. Give a stimulant
B. Elevate the victim's head
C. Stop severe bleeding
D. Treat for shock

Reference: The Ship's Medicine Chest and Medical Aid at Sea

2. You are steering 001° by magnetic compass. The variation is 2° west and the deviation is 1° east. The true course being steered is

A. 359°
B. 000°
C. 002°
D. 003°

Reference: Bowditch, American Practical Navigator

3. One of the requirements necessary to satisfy a general average act is

A. a successful venture.
B. no losses.
C. no imminent peril.
D. all of the above.

Reference: Marton, Tanker Operations

4. A special flashing light is used on a vessel

A. being pushed ahead.
B. towed alongside.
C. towed astern.
D. any of the above.

Reference: COMDINST M16672.2A

5. Before gasoline can burn, its temperature must be

A. below its flash point.
B. equal to or above its flash point.
C. above the explosive range.
D. none of the above.

Reference: Baptist, Tanker Handbook for Deck Officers

ANSWERS

ENGINEER
1-B;2-B;3-A;4-B;5-D
DECK
1-A;2-B;3-A;4-A;5-B

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone: (405) 686-4417.

NEW PUBLICATIONS

continued from page 135

reports available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA, 22161.

"At-Sea Test and Demonstration of Petroleum Coke-Oil Mixtures (PETCOM)" presents the results of burning petroleum coke/oil mixtures at sea onboard the SS MARINE DUVAL. (Order number PB86-153897; price $28.95). A second report, "Performance Characteristics of an Alternatively Configured Fluidized Bed Superheater Subjected to Simulated Ship Motions, Volume I," reflects research conducted by the Webb Institute of Naval Architecture under MARAD's University Research Program. (Order number PB86-155470; price $11.95). "Development of Accuracy Control Computer Programs, Data Management and CAD/CAM Interfaces" covers work performed by the University of Washington. (Order number PB86-152956; price $16.95).

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Admiral Paul A. Yost, Jr., USCG
Commandant

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Cover

The Coast Guard played an active role in helping the nation celebrate the Statue of Liberty's 100th birthday. Happy Independence Day from the Marine Safety Council Staff. (Official U.S. Coast Guard photo)

Workboats of the U.S. Coast Guard

In the March 1986 issue of ***Proceedings,*** *we published photographs showing some of the Coast Guard's search and rescue equipment. In this issue, we'd like to highlight the Coast Guard's workboats: equipment used for icebreaking, maintaining aids to navigation, and other related duties. Special thanks to PA1 Jerry Snyder, Office of Boating, Public, and Consumer Affairs, for compiling this information. (Official U.S. Coast Guard photos)*

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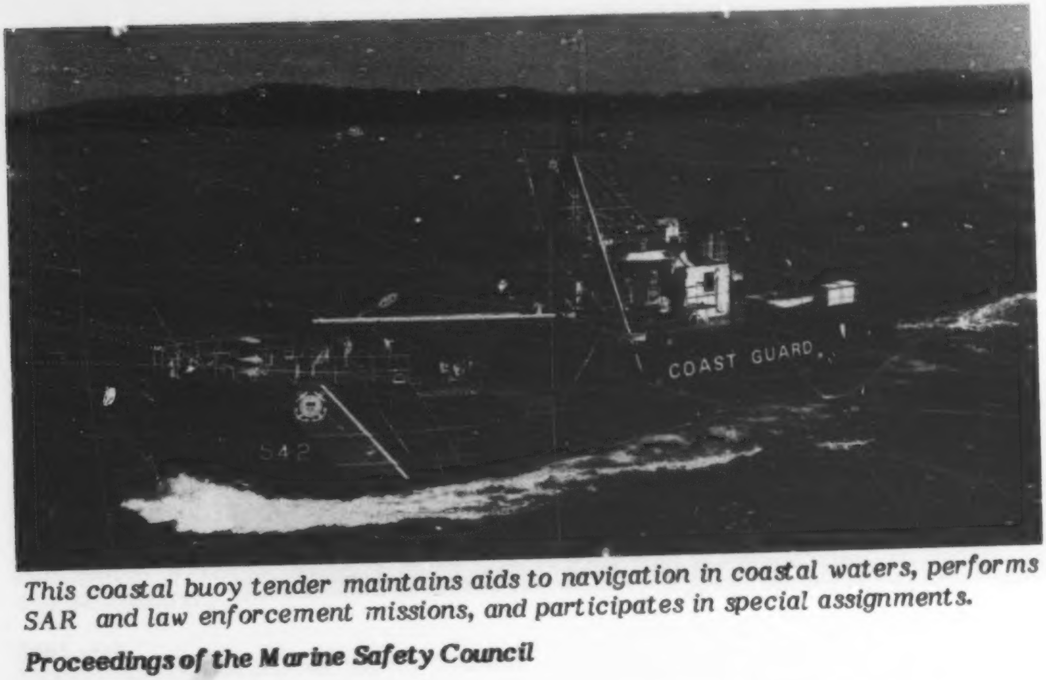
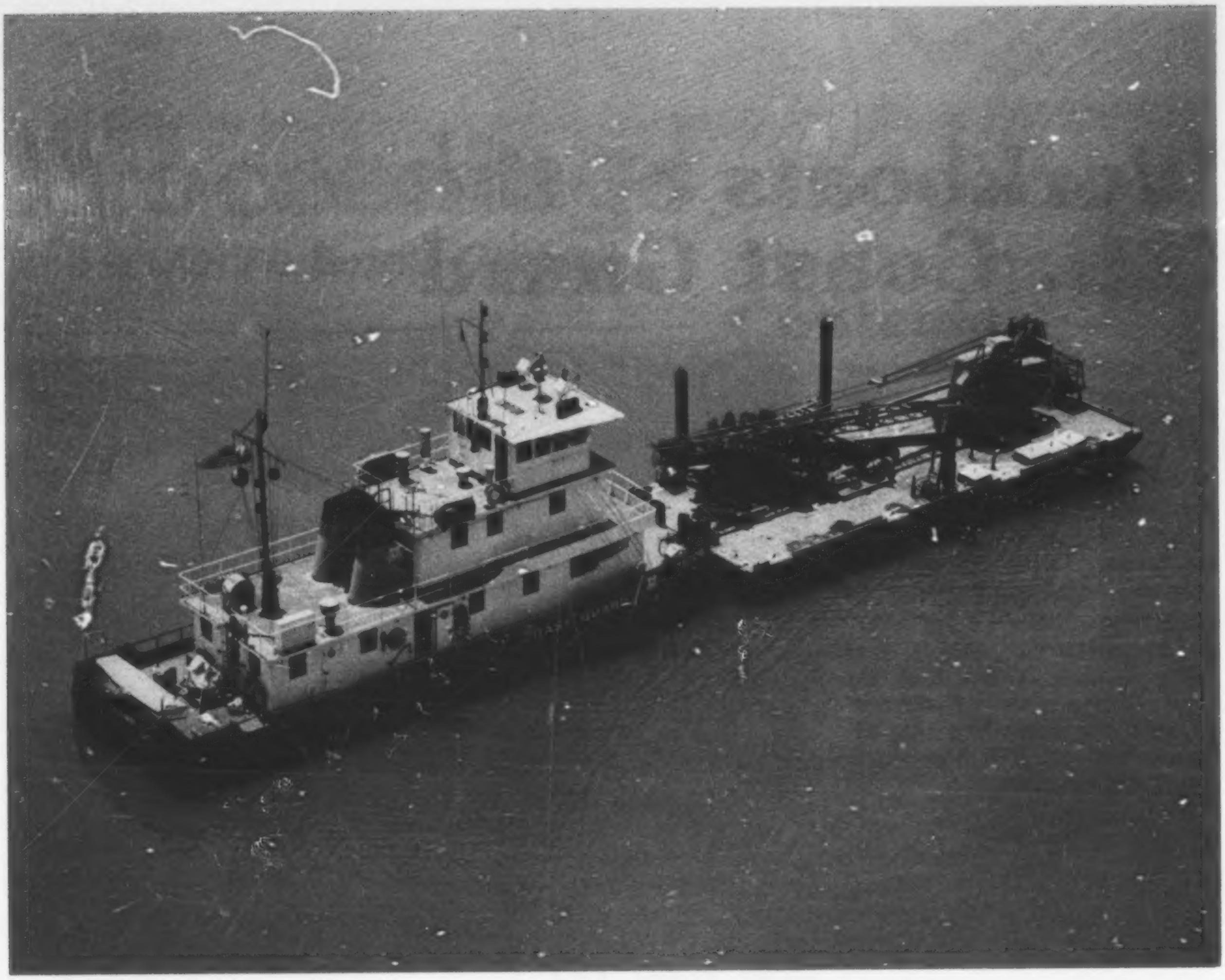
COAST GUARD

This 110-foot tug is used for breaking ice and for coastal search and rescue missions.



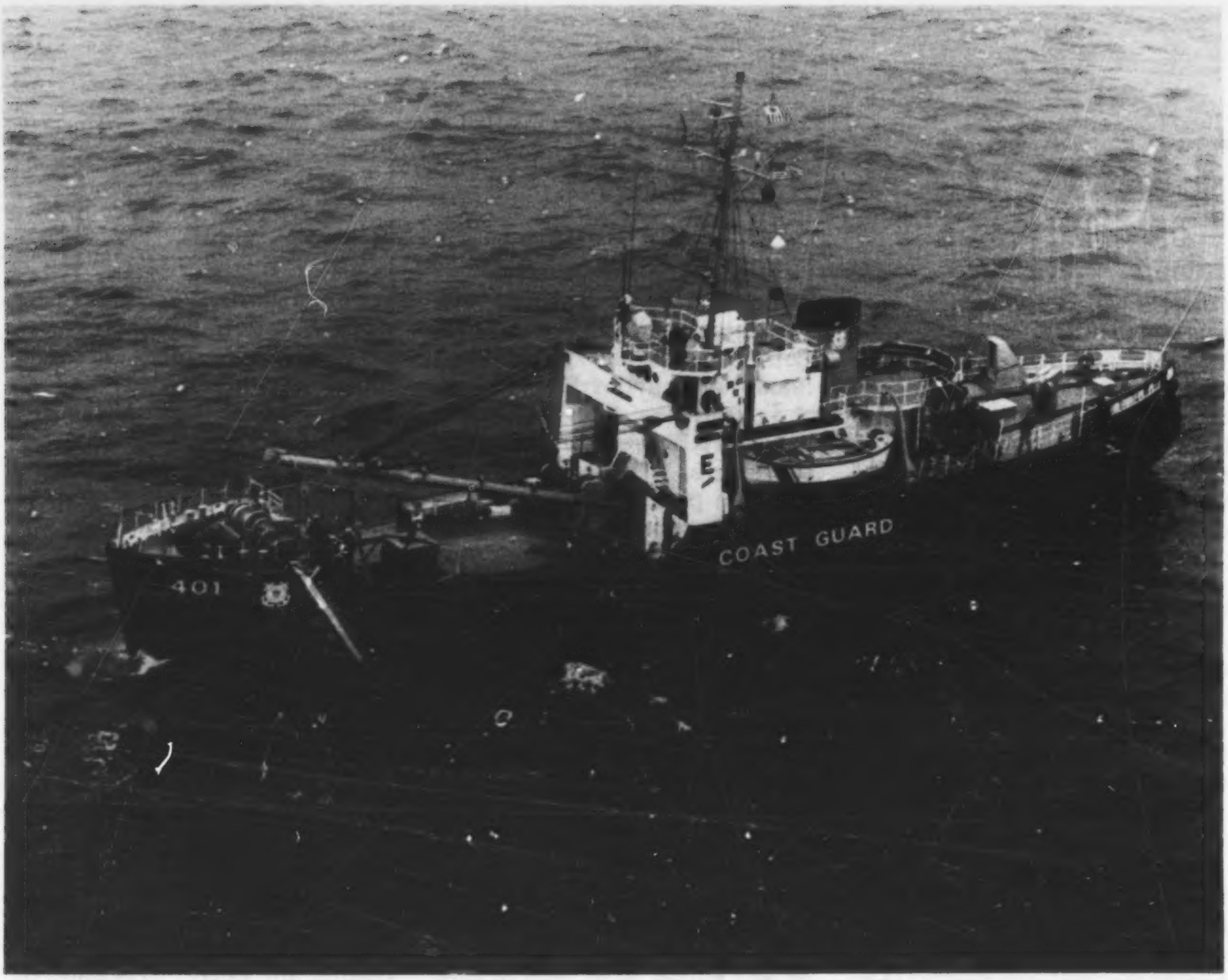
This coastal buoy tender maintains aids to navigation in coastal waters, performs SAR and law enforcement missions, and participates in special assignments.



The Coast Guard's river tenders maintain aids to navigation on the Mississippi River and its navigational tributaries.

COAST GUARD

The Coast Guard's harbor tugs are employed in towing, assisting vessels in trouble, boarding, law enforcement, firefighting, and light icebreaking.



The "400 series" (note number 401 on this vessel's bow) of seagoing buoy tenders is considered the backbone of the Coast Guard's buoy tender fleet. These vessels have icebreaking bows for work in northern points. They also perform aids to navigation duties.

SAN FRANCISCO Named Gallant Ship

Secretary of Transportation Elizabeth Hanford Dole has named the pilot boat SAN FRANCISCO a "Merchant Marine Gallant Ship" for lifesaving actions while assisting the tanker PUERTO RICAN. The tanker exploded as it was leaving San Francisco Bay in October 1984.

The Merchant Marine Gallant Ship Award is among several awards authorized by the Congress for presentation by the Secretary of Transportation. It may be granted to a United States merchant vessel for outstanding or gallant action which saves lives or property in a marine disaster.

As master of the SAN FRANCISCO, Captain Peter Crowell will receive the Merchant Marine Meritorious Service Medal for directing the rescue of crewmen blown overboard in the tanker's explosion. Captain James S. Nolan, San Francisco Bay pilot who was rescued after the PUERTO RICAN exploded, will receive the Distinguished Service Medal.

Nolan, who sustained leg and pelvic fractures and third-degree burns, directed the SAN FRANCISCO to rescue Third Officer Philip Lempriere of the PUERTO RICAN first. Lempriere was blinded by chemical residue and suffered severe burns over half his body. The other crew member could not be found.

The awards were presented aboard the SS JERIMIAH O'BRIEN in San Francisco Bay by John Gaughan, Maritime Administrator, U.S. Department of Transportation. ⚓

The "A Boats"

Editor's Note: The fishing vessels AMERICUS, ALTAIR, ALYESKA, and ALLIANCE routinely participated in Alaskan commercial fisheries under the direction of the same managing owner. This fleet of vessels often was referred to as the "A boats."

Vessel Information

The U.S.-registered fishing vessels AMERICUS and ALTAIR were the second and the last, respectively, of seven sister vessels built by Dakota Creek Industries, Inc., (Dakota Creek) of Anacortes, Washington. The AMERICUS was built in 1978 and the ALTAIR was built in 1980. Both vessels were owned by a group of partners. Jeff Hendricks, Inc., Nations Enterprises, Inc., Beirnes Enterprises, Inc., and Robert E. Resoff each owned a one-sixth share of each vessel, and Sea Pacific, Inc. owned a one-third share of each vessel. Neither vessel was inspected by the Coast Guard, nor was either required to be.

The AMERICUS and the ALTAIR each had an overall length of 123.5 feet, a beam of 32 feet, and a depth at amidships of 14 feet. The AMERICUS admeasured 194 gross tons and 131 net tons; the ALTAIR admeasured 190 gross tons and 129 net tons. Both vessels had a designed maximum draft of 13 feet.

Both the AMERICUS and the ALTAIR were propelled by a single, 84-inch-diameter variable pitch propeller driven by a 16-cylinder, 1125-horsepower, freshwater-cooled, turbocharged diesel engine. Each vessel had a single, hydraulically operated rudder. The AMERICUS and the ALTAIR had a maximum speed of about 10 knots.

The AMERICUS and the ALTAIR were originally designed and built as typical, modern crab fishing vessels with large, open deck areas aft and enclosed forecastles and pilothouses forward. The welded steel hulls had a single chine, raked bow, and square stern. The forecastle contained a dry goods storage area, three staterooms with accommodations for eight persons, a toilet/shower room, a large frozen stores area, a galley and mess area, and an accessway to the pilothouse above and the engineroom below. Aft of the forecastle, the open main deck where the crab pots were carried was protected by wood planks fitted on supports a few inches above the steel deck. One 8-ton-capacity crane was located on the port side of the main deck slightly aft of amidships, and another was on the forecastle deck on the starboard side. (See figure 1.)

The engineroom was inboard below the forecastle. Outboard of the engineroom on the port and starboard sides were cofferdams, fresh water tanks, and lubricating and hydraulic oil tanks. Forward of the engineroom was the fuel oil day tank and chain locker. Aft of the engineroom were

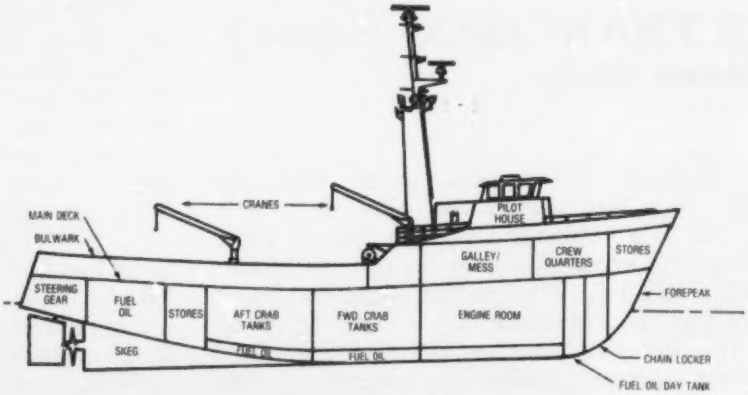


Figure 1. Profile view of AMERICUS before installation of trawling gear.

This article was taken from the National Transportation Safety Board's Marine Accident Report No. NTSB/MAR-86/01.

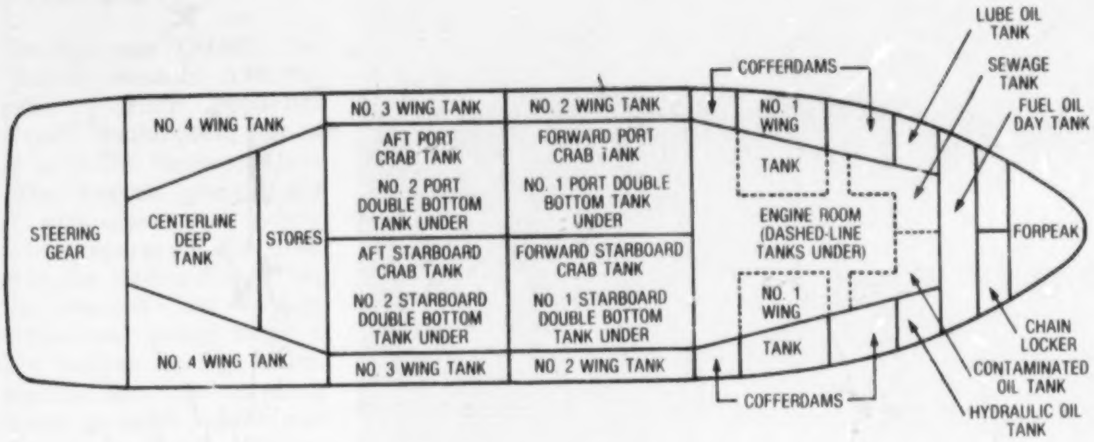

LUBE OIL TANK
SEWAGE TANK
FUEL OIL DAY TANK
COFFERDAMS
NO. 4 WING TANK
NO. 3 WING TANK
NO. 2 WING TANK
NO. 1 WING TANK
AFT PORT CRAB TANK
FORWARD PORT CRAB TANK
NO. 2 PORT DOUBLE BOTTOM TANK UNDER
NO. 1 PORT DOUBLE BOTTOM TANK UNDER
STEERING GEAR
CENTERLINE DEEP TANK
STORES
ENGINE ROOM (DASHED-LINE TANKS UNDER)
FORPEAK
AFT STARBOARD CRAB TANK
FORWARD STARBOARD CRAB TANK
NO. 2 STARBOARD DOUBLE BOTTOM TANK UNDER
NO. 1 STARBOARD DOUBLE BOTTOM TANK UNDER
NO. 1 WING TANK
NO. 4 WING TANK
NO. 3 WING TANK
NO. 2 WING TANK
CHAIN LOCKER
CONTAMINATED OIL TANK
COFFERDAMS
HYDRAULIC OIL TANK

Figure 2. Tank arrangements and capacities for AMERICUS.

the four crab tanks, a dry storage area, and a centerline fuel oil tank. The steering gear compartment was at the stern. Fuel oil wing tanks extended aft from the aft cofferdam bulkhead to the forward bulkhead of the steering gear compartment. Fuel oil double bottom tanks were located below the crab tanks. (See figure 2.)

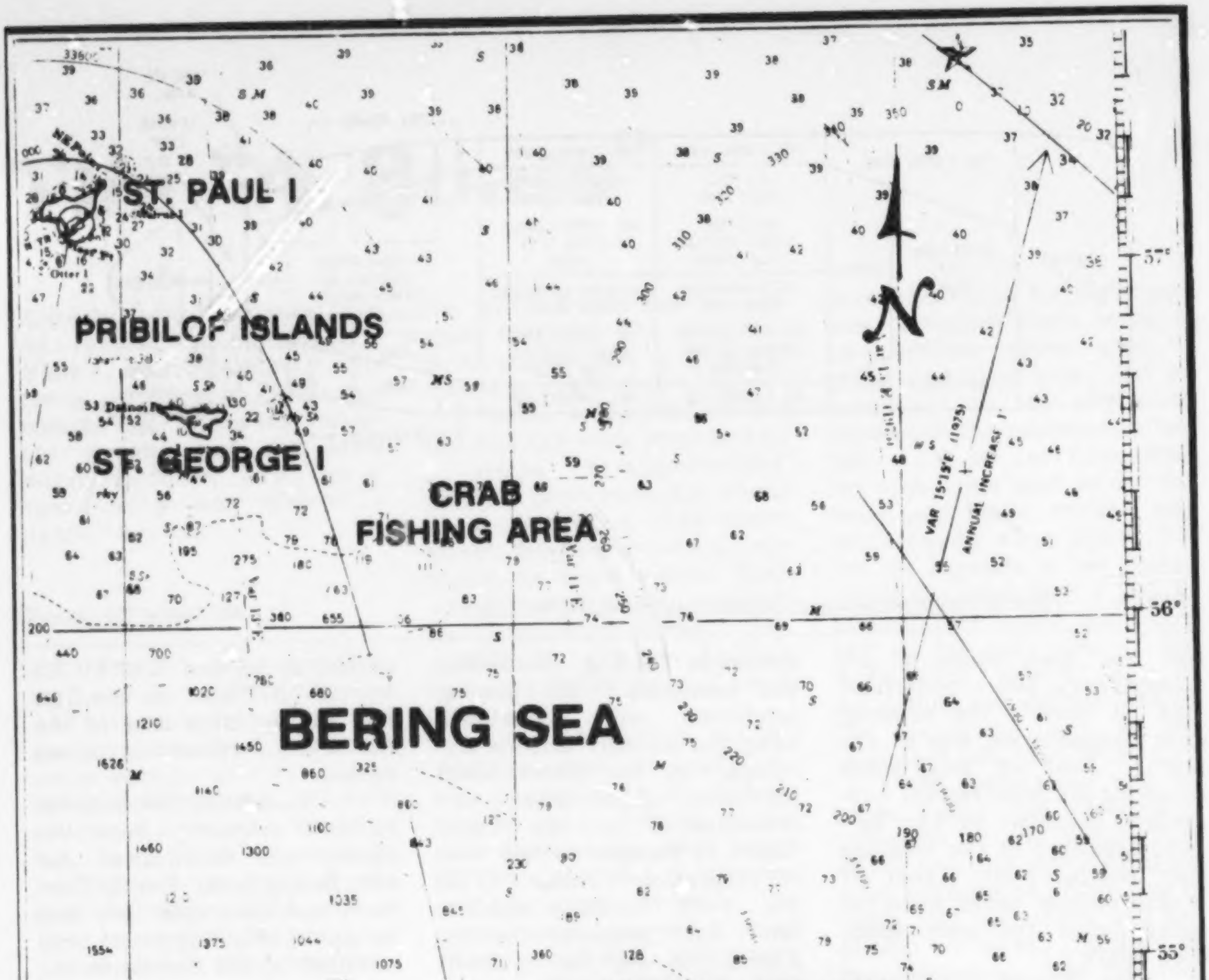
The fishing vessel ANTARES was the first-built vessel of the seven sisterships that included the AMERICUS and ALTAIR. A stability test[1] was conducted on the ANTARES by the designer on April 15, 1978. Based on that stability test, a stability booklet, which included a stability letter and numerous loading conditions, was prepared. The loading conditions were developed using the stability criteria developed by the International Maritime Organization and disseminated by the Coast Guard in Navigation and Vessel Inspection Circular (NVIC) No. 3-76. Stability booklets later were prepared for the AMERICUS and the ALTAIR using the lightship data determined by the stability test of the ANTARES. The lightship data for the AMERICUS was assumed to be the same as for the ANTARES, and the lightship data for the ALTAIR was calculated from the ANTARES lightship data by making an allowance for the weight of crab tank insulation which was installed on the ALTAIR but not on the ANTARES or AMERICUS. No stability tests or deadweight surveys[2] were conducted on the AMERICUS or the ALTAIR to confirm that the lightship data of the ANTARES applied to those vessels.

The AMERICUS and the ALTAIR originally were designed and constructed for crab fishing only. During February and December 1981 and January 1983, equipment was installed on the vessels to enable them to trawl for fish. Hydraulic pumps and piping, electric motors, rubber stern bumpers, winches, wire cables, drag stanchions, a net reel, and other heavy equipment were added to each vessel. Additional electronic equipment was installed in the pilothouse. The repair manager at the Dakota Creek shipyard where the work was performed calculated that the total weight added to each vessel was about 35.2 long tons. At the completion of the conversions, neither a stability test nor a deadweight survey was performed on either vessel. The vessel's stability booklets were not amended to reflect the addition of the trawling gear.

---

[1] *A stability test involves the movement of known weights across the deck of a vessel and the measurement of the vessel's heel with the weight movement. A stability test is conducted to determine a vessel's lightship data (the vessel's displacement and the vertical and longitudinal location of its center of gravity in the unloaded condition).*

[2] *A deadweight survey is conducted to determine a vessel's displacement and longitudinal center of gravity, but not its vertical center of gravity, in the unloaded condition.*


ST. PAUL I
PRIBILOF ISLANDS
ST. GEORGE I
CRAB FISHING AREA
BERING SEA
CAPSIZED AMERICUS FOUND BY NEPTUNE JADE
AMERICUS SANK
UNALASKA BAY
DUTCH HARBOR
UNALASKA ISLAND
SCALE OF NAUTICAL MILES
0 10 20 30 40 50
N
57°
56°
55°
54°
170°
169°
168°
167°
166°
165°

The capsized AMERICUS.

Events Preceding the Accident

On February 3, 1983, the U.S. fishing vessels AMERICUS and ALTAIR departed Anacortes, Washington, on a voyage to Dutch Harbor, Alaska. The vessels were fully loaded with fuel and galley stores in preparation for crab fishing in the Bering Sea. This was the vessels' first voyage (other than sea trials) since a shipyard period during which the installation of trawling equipment on each vessel was completed. In Dutch Harbor, the vessels were to be loaded with crab pots and were then to proceed to the crab fishing grounds selected by their respective captains. (See figure 3.)

The 7-day voyage from Anacortes to Dutch Harbor was uneventful. The vessels' managing owner estimated that each vessel burned about 10,000 gallons of diesel fuel during the voyage. Because diesel fuel was less expensive in Anacortes than in Dutch Harbor, both vessels carried fuel to be transferred to the M/V SEA ALASKA, a fish processing vessel owned by Sea Alaska Products, Inc. (Sea Alaska). On February 10, shortly after arriving at the Sea Alaska terminal at Dutch Harbor, the AMERICUS' engineer attempted to transfer fuel to the SEA ALASKA but was unsuccessful because of "a problem with their [AMERICUS] pump," according to a SEA ALASKA engineer. Meanwhile, the ALTAIR was moored alongside a Sea Alaska dock where the vessel's crab pots were being delivered from the storage area. One hundred crab pots were delivered to the ALTAIR on February 10 and were loaded on deck by the vessel's crew.

On February 11, after the pump problem had been corrected, the AMERICUS' engineer transferred 28,000 gallons of diesel fuel to the SEA ALASKA. An engineer on the SEA ALASKA testified that the AMERICUS' engineer said that he would transfer between 25,000 and 30,000 gallons, and that after he had emptied "a front tank with 8,000 or 10,000 gallons," he could determine the length of time necessary to empty the other tanks. Meanwhile, the ALTAIR's crew continued loading crab pots onto the vessel's deck. An additional 112 crab pots were delivered to the ALTAIR on February 11, along with 289 32-pound cases of frozen herring to be used as bait. The AMERICUS received 280 cases of frozen herring.

During the afternoon, an employee of the State of Alaska, Department of Fish and Game, boarded the ALTAIR from another vessel. He noted water flowing from the ALTAIR's crab tank overflows and concluded that some of the vessel's crab tanks were full of water. He testified, "...I know...that he was pumping because the vessel I was on was a smaller vessel, about 90 foot, and the way it tied up to it, the 'A' boats are such larger vessels and sit so much higher out of the water when they're dry that we would have had considerably more effort to put our gear over on the ALTAIR's deck, and we didn't have that."

On February 12, the ALTAIR was shifted from the dock to alongside the SEA ALASKA to transfer fuel. Sea Alaska's records show that 27,730 gallons of diesel fuel were transferred from the ALTAIR to the SEA ALASKA. Meanwhile, the AMERICUS had shifted from alongside the SEA ALASKA to the dock where the crew began loading crab pots. One hundred four crab pots were delivered to the AMERICUS on February 12.

On February 13, the crews continued loading crab pots onboard. Another 12 crab pots were delivered to the ALTAIR, and an additional 126 crab pots were delivered to the AMERICUS. Two of the crab pots delivered to the AMERICUS were broken and were not loaded on board.

◄◄ *Figure 3 (previous page). Bering Sea crab fishing grounds and location of AMERICUS.*

Each crab pot was 7 feet long, 7 feet wide, and had a height of 32 inches. The pots were constructed of steel bars and weighed about 690 pounds each. The crab pots in the first tier on each vessel were stacked on end, and the crab pots in tiers two through six were laid flat. The crab pots were secured to each other and to the vessels with chains.

About 1200, the captain of the fishing vessel ALLIANCE, which also was loading crab pots at the Sea Alaska terminal, went on board the ALTAIR to ascertain from that vessel's captain the location of his intended crab fishing area. He testified that he was on board the ALTAIR for 15 to 20 minutes and discussed nothing other than the crab fishing area with the ALTAIR's captain. He later recalled that he had seen water flowing over the ALTAIR's port side forward of the crane, which indicated to him that "there was a possibility that the ALTAIR departed with all four crab tanks full."[3]

About 1700, the Sea Alaska operations manager boarded the ALTAIR to deliver a communications code sheet to the vessel's captain. The crew was still loading crab pots on deck, and the operations manager noticed seawater flowing out of the crab tank overflows. He testified that he believed that the forward crab tanks were full of seawater at that time.

During the evening, the engineer from the fishing vessel ALYESKA, which also was being loaded with crab pots at the Sea Alaska terminal, went on board the ALTAIR to borrow a hose coupling. He characterized his conversation with the ALTAIR's engineer as "general chit-chat." He testified that the crew had completed loading the crab pots by that time, but he had no information about the condition of the ALTAIR's crab tanks or fuel tanks. The ALYESKA's engineer then went on board the AMERICUS to ask for "a check valve for a saltwater pump." He and the AMERICUS' engineer discussed the amount of fuel that had been transferred from their vessels to the SEA ALASKA, but they did not exchange any information regarding which specific fuel tanks on their respective vessels had been emptied. The ALYESKA's engineer said that he had pumped the ALYESKA's four crab tanks full of seawater, and he testified that the AMERICUS' engineer told him that the AMERICUS' crab tanks were "cross-tanked."[4]

During the evening, the AMERICUS was moored to the dock at the Sea Alaska terminal. The ALLIANCE was moored to the AMERICUS, and the ALTAIR was moored to the ALLIANCE. About 0230 on February 14, the ALTAIR's lines were cast off, and the vessel departed for the crab fishing grounds near the Pribilof Islands. The captain and the engineer of the ALLIANCE watched the ALTAIR depart, and both testified that the ALTAIR appeared "normal."

About 0330, the helmsman of the fishing vessel SILVER WAVE, which was en route to Dutch Harbor, saw the ALTAIR proceeding on a course toward the Pribilof Islands at about 10 knots. The helmsman said that he saw the name "ALTAIR" on the vessel's bow as the vessels passed starboard to starboard, and that the ALTAIR appeared "normal." He did not take any particular note of the ALTAIR's trim, freeboard, or deck load of crab pots. No whistle signals were sounded, and no radio communications were established. The SILVER WAVE continued on its voyage and arrived at Dutch Harbor about 0700.

The captain and engineer of the ALLIANCE and two Sea Alaska employees watched the AMERICUS depart from the dock about 0830. The ALLIANCE's master testified that the AMERICUS looked "normal," and the engineer said that the red boot-topping paint was visible at the bow and "right at the water" at the stern. The Sea Alaska operations manager saw water flowing out of the crab tank overboard discharge. The Sea Alaska foreman cast off the AMERICUS' stern line from the dock and noted that the waterline was near the "red line" on the hull. None of these persons observed anything unusual about the AMERICUS when it departed.

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[3] *The captain of the ALLIANCE indicated that it is common practice when flooding crab tanks to remove every other bolt from the hatch covers and to loosen the remaining bolts to relieve pressure in the upper reaches of the crab tanks and to prevent the crushing of crab. This would allow seawater to flow out of the hatches, across the deck, and down the vessel's sides. The captain of the ALLIANCE had previously sailed as a deckhand and engineer on the ALYESKA and as engineer and relief captain on the AMERICUS.*

[4] *The AMERICUS and ALTAIR each had four crab tanks. When cross-tanked, one forward crab tank and one aft crab tank on the opposite side of the vessel would be filled, e.g., the forward port tank and the aft starboard tank. According to the managing owner, individual crab tanks were not filled partially; a crab tank would either be completely full or completely empty.*

The Accident

About 1430 on February 14, 1983, personnel aboard the M/V NEPTUNE JADE sighted a capsized vessel with red bottom paint and a blue hull about 30 nautical miles northwest of Dutch Harbor. (The vessel was later identified as the AMERICUS.) The NEPTUNE JADE searched the area near the capsized vessel, but no persons or flotsam were found. The NEPTUNE JADE transmitted radio messages, which initially were relayed by the M/V ALEUTIAN DEVELOPER, to report the capsized vessel to the U.S. Coast Guard Communications Station at Kodiak, Alaska. A short time later, the capsized vessel was sighted by personnel on board the M/V OCEAN BROTHER. The OCEAN BROTHER also searched the area around the capsized vessel, found no survivors, and informed the Coast Guard of the capsized vessel.

Personnel aboard the M/V NEPTUNE JADE sighted a capsized vessel with red bottom paint and a blue hull.

Upon receipt of the NEPTUNE JADE's messages, beginning about 1450, the Coast Guard began what was to become a major, 6-day, air-sea search. Since no Coast Guard vessels were near the reported location of the capsized vessel, and since the closest Coast Guard facility with search and rescue capabilities was the base at Kodiak about 600 nautical miles away, the Coast Guard North Pacific Search and Rescue Coordinator at Juneau, Alaska, initially requested assistance from the Unalaska Police Department, the Dutch Harbor detachment of the Alaska State Troopers, and civilian aircraft and vessels near the scene. Visual searches by aircraft initially were hampered by the low ceiling and restricted visibility.

Meanwhile, the captain of the fishing vessel ALASKA INVADER had heard the radio message regarding the capsized vessel. The ALASKA INVADER and the nearby PACIFIC INVADER changed course and headed toward the reported location of the capsized vessel. According to the captain of the ALASKA INVADER, they arrived on scene between 1900 and 2000 and began searching for the capsized vessel and survivors. About 2030, the Soviet fish processing vessel SVETLAYA responded to the Coast Guard's Urgent Marine Information Broadcast and joined the search, and another Soviet fish processing vessel, the TURKUL, arrived about 2200.

At daybreak on February 15, an HC-130 search aircraft and the fishing vessel GOLDEN PISCES joined the SVETLAYA and TURKUL on scene. On board the GOLDEN PISCES were the captain, an Alaska State Trooper, a policeman who was also the Unalaska Dive Team captain, four volunteers from the Dive Team, and a commercial diver. The GOLDEN PISCES' captain recognized the capsized vessel as "one of the 'A' boats," and, after sighting the capsized vessel's bow emblem, believed that it was the AMERICUS. He later testified, "I called the ALYESKA and informed them that it was one of their boats, but I wasn't sure which one, and they started calling the ALTAIR and then a little later when the [crab pot] buoy set-ups came up and I could get the number off it, I passed that on to the ALYESKA and they came back that it was the AMERICUS' buoys."

"...when the buoy set-ups came up and I could get the number off it, ...the ALYESKA... came back that it was the AMERICUS' buoys."

After speaking with the captain of the GOLDEN PISCES and concluding that the capsized vessel was the AMERICUS, the captain of the ALYESKA contacted the captain of the ALLIANCE and unsuccessfully attempted to contact the ALTAIR. The ALYESKA and the ALLIANCE proceeded to 75-fathom-deep water and unloaded 40 and 32 crab pots, respectively, from the deck to provide space for rescue operations. Both vessels then headed for the capsized AMERICUS and continued to attempt to contact the ALTAIR by radio. About 1630, the Coast Guard was advised that the ALTAIR was missing.

About 0530 on February 16, the Coast Guard cutter SHERMAN arrived onscene. The floating, capsized hull of the AMERICUS had served as an excellent datum marker for the search for survivors from that vessel; however, since the location of the ALTAIR was unknown, the search area was expanded greatly, and the number of search craft was increased. Beginning early in the morning, the SHERMAN, its onboard HH-52 search helicopter and two HC-130 search aircraft and an HH-3 search helicopter from the Coast Guard Air Station at Kodiak, the ALLIANCE, and the ALYESKA continued the search for survivors and for the ALTAIR. About 0930, a Navy P-3 Orion aircraft from the Naval Station at Adak, Alaska, joined the search.

About 1130, the captain of the ALLIANCE saw the capsized AMERICUS sink stern-first in about 700 fathoms of water at latitude 54°24'N., longitude 168°22'W. A few minutes later, an inflatable liferaft and two ring life buoys rose to the surface and were taken onboard the ALLIANCE.

The search for survivors and for the ALTAIR continued until February 20, 1983. Coast Guard, Navy, and Air Force aircraft and Coast Guard vessels searched more than 26,000 square miles. Private vessels and aircraft searched additional areas. Despite the extensive search, neither the ALTAIR nor survivors were found.

On March 16, 1983, an inflatable liferaft, positively identifed later as equipment from the ALTAIR, was found by the ALLIANCE while en route to the Pribilof Islands at latitude 54°24'N., longitude 166°53'W., about 35 nautical miles northwest of Dutch Harbor. The raft was deflated and torn in several places, and all of the raft's equipment was missing. One end of the raft was covered with a typical green marine algae. There was no evidence to suggest that persons had attempted to use the raft.

On June 6, 1985, while trawling for bottom fish, the fishing vessel ACE BONO MARU No. 2 retrieved a crab pot from the AMERICUS in its trawl net at approximately 54°21'N. latitude, 166°57'W. longitude. The ALTAIR still has not been located.

Stability Tests

No stability tests or deadweight surveys had been performed on the AMERICUS or the ALTAIR. The original lightship characteristics for both vessels had been derived from the results of a stability test on the sister vessel ANTARES, even though the difference in crab tank construction on the ALTAIR had added about 7.6 tons to the vessel's lightship displacement. Although the extrapolation of lightship data from one vessel to another might have been standard practice within the fishing vessel construction industry at the time, a deadweight survey probably would have been required to verify the lightship characteristics of the AMERICUS and the ALTAIR if those vessels had been required to meet Coast Guard stability standards for inspected vessels.

Stability tests of similar vessels showed significant increases in the vessels' displacements over the known weights of added trawling gear and other modifications.

After the accidents, stability tests of several other fishing vessels similar to the AMERICUS and the ALTAIR showed significant increases in the vessels' displacements above the known weights of added trawling gear and other modifications. If stability tests had been performed on the AMERICUS and the ALTAIR after the trawling gear had been installed, the increases in displacement and any inherent reductions of stability would have been discovered and quantified, and the vessels' stability booklets and stability letters could have been modified appropriately. The revised stability information would have shown the reduced crab pot loading capacity and any other precautions necessary to ensure safe loading. If the stability information had been amended and provided to the captains of the AMERICUS and the ALTAIR, and if the captains had used the information properly, these accidents might have been prevented.

After the AMERICUS and the ALTAIR had been in service for some time, both vessels underwent conversions to allow trawling operations. The installation of the trawling gear to the vessels added significantly to their lightship displacements, but again no stability tests or deadweight surveys were conducted, and the vessels' stability information was not amended. For inspected vessels and for some uninspected vessels such as tugboats, the Coast Guard requires that a stability test be conducted after major modifications are made. Although the Coast Guard recently has published new voluntary stability standards for uninspected commercial fishing vessels that include recommendations for stability tests and stability information, there is no statutory requirement that stability information be provided to the captains of commercial fishing vessels. The Coast Guard's NVIC 6-68, published in 1968, and NVIC 3-76, published in 1976, each contained recommendations for stability tests and stability information for commercial fishing vessels, but commercial fishing vessels continue to be operated without adequate stability information. For example, the National Transportation Safety Board (NTSB) recently has investigated stability-related accidents involving the commercial fishing vessels AMAZING GRACE, LIBERTY, SANTO ROSARIO, and ATLANTIC MIST where no stability information had been provided to the captain. The high number of stability-related fishing vessel accidents (more than 100 in 1983) indicates that reliance on voluntary compliance with stability standards is ineffective, and the NTSB believes that statutory requirements are necessary.

Probable Cause

The NTSB determines that the probable cause of the capsizing of the AMERICUS was inadequate intact stability caused by improper loading and the addition of trawling gear. Contributing to the accident was the owners' failure to determine the stability characteristics of the AMERICUS and to amend the vessel's stability information after the trawling gear was installed, and the captain's failure to comply with the provisions of the existing stability information.

The NTSB determines that the probable cause of the loss of the ALTAIR was capsizing as a result of inadequate intact stability caused by improper loading and the addition of trawling gear. Contributing to the accident was the owners' failure to determine the stability characteristics of the ALTAIR and to amend the vessel's stability information after the trawling gear was installed, and the captain's failure to comply with the provisions of the existing stability information.

Recommendations

As a result of its investigation of this accident, the NTSB made the following recommendations:

—to the North Pacific Fishing Vessel Owners' Asociation:

Recommend that your members require a stability test on each new vessel unless a deadweight survey confirms that the stability data from a sister vessel may be used. (Class II, Priority Action) (M-86-1)

Recommend that your members require a stability test or deadweight survey and amended stability information when major modifications, such as the addition of trawling gear, are made to a vessel. (Class II, Priority Action)(M-86-2)

Recommend that your members require vessel operators in their employ to comply strictly with the provisions of vessel stability letters and stability booklets. (Class II, Priority Action)(M-86-3)

—to Jeff Hendricks & Associates (managing owner):

Require a stability test on each new vessel unless a deadweight survey confirms that the stabilty data from a sister vessel may be used. (Class II, Priority Action)(M-86-4)

Require a stability test or deadweight survey and amended stability information when major modifications, such as the addition of trawling gear, are made to your vessels. (Class II, Priority Action)(M-86-5)

Require your vessel operators to comply strictly with the provisions of vessel stability letters and stability booklets, and establish a monitoring system to ensure compliance. (Class II, Priority Action)(M-86-6)

Provide formal training for your fishing vessel captains in vessel stability and the use of vessel stability information to establish safe loading conditions. (Class II, Priority Action)(M-86-7)

—to Dakota Creek Industries, Inc.:

Recommend to your clients that a stability test be conducted on each new vessel constructed at your shipyard unless a deadweight survey confirms that the stability data from a sister vessel may be used. (Class II, Priority Action) (M-86-8)

Recommend to your clients that a stability test or deadweight survey, as appropriate, be conducted on each vessel that undergoes a major modification, such as the addition of trawling gear, at your shipyard. (Class II, Priority Action)(M-86-9)

Recommend to your clients that complete stability information be prepared for each vessel constructed or modified at your shipyard. (Class II, Priority Action)(M-86-10)

—to the U.S. Coast Guard:

Seek legislative authority to require that stability tests be conducted and that complete stability information be provided to the captains of commercial fishing vessels. (Class II, Priority Action)(M-86-11) ⇣

Deterioration Hazard to Rubber Fuel Hoses

The Coast Guard is cautioning recreational boat owners with inboard gasoline engines to watch closely for damaged or leaking fuel hoses, which could cause a fire or explosion.

The danger comes from alcohol-gasoline blends which have replaced leaded fuel. Alcohol, which increases octane ratings, also causes deterioration of rubber fuel hoses and eventually the fuel leaks through. On boats with enclosed engine compartments, such leaks create a fire and explosion hazard.

To help boaters solve this problem, a new alcohol-resistant fuel hose has been developed, and the Coast Guard is permitting its use immediately, pending regulatory changes to the Coast Guard's Fuel System Standard.

Alcohol-gasoline blends have become common since the Environmental Protection Agency ordered the lead in regular gasoline reduced to less than one-half of one percent by January 1, 1986.

Anticipating the effect of the alcohol-gasoline blends, the Coast Guard and its National Boating Safety Advisory Council last year requested industry to develop a new standard. Prompt action by the Society of Automotive Engineers' Marine Technical Committee resulted in Standard SAE J1527DEC85. The new standard sets a permeation rate — the rate at which fuel passes through the walls of the hose — which is one-sixth of that specified under the present standard. The lower rate is achieved by reducing the plasticizers (wax) in the hose.

Because of the deterioration hazard, the Coast Guard urges all owners of inboard, inboard-outdrive, and jet-drive, gasoline-powered boats to inspect their fuel hoses frequently, especially near the engine where heat can accelerate deterioration. Damaged hoses may be dry and cracked or soft and mushy.

A hose that has failed should be replaced immediately, preferably with one meeting the new standard. If that is not available, owners should use any hose marked "USCG Type A."

Seattle Trade Show Expanded

"Pacific Marine Expo" will be the name of an expanded marine trade show slated for November 20-22, 1986, at the Seattle Center Exhibition Hall. Originally called Fish Pacific, the show has been rechristened to reflect its status an an exposition of equipment and ideas for fishing and work boat professionals.

Sponsored by National Fishermen Expositions, Inc., Pacific Marine Expo meets the demand for a regional trade show to serve the highly professional commercial marine industries of the West Coast and Alaska.

In odd-numbered years, National Fisherman's long-established international Fish Expo showcases the latest developments in marine technology for the commercial fishing fleet. But commercial fishermen aren't the only ones who visit Fish Expo. Professionals from a broad spectrum of the marine industries come to view the state of the art in electronics, propulsion systems, and other gear that is as common to work boats as it is to fishing vessels.

In even-numbered years, Fish Expo moves to Boston, and the West Coast is left without a major commercial marine trade show. Now, Pacific Marine Expo will fill that void. It will bring to Seattle the same exhibit and seminar quality that has marked Fish Expo during its 20-year history, but the focus will be broadened to encompass the fishing and work boat industries.

It will be a unique event that reflects the West Coast commercial marine industry. From California to Alaska, from the towboats and supply vessels, to the troller and trawlers, the commercial fleets of the region are technologically advanced, capital-intensive operations that support an equally sophisticated concentration of marine-oriented businesses.

For more information, contact John Sabella at (206) 283-1150.

Preparing for a Coast Guard License Examination

LT J.K. Dabney

One of the questions that Coast Guard licensing personnel hear most often is, "How and what do I study for my examination?" This article will outline some popular study methods used by license applicants and will present some points to consider when taking an examination.

PURPOSE OF THE EXAMINATION

Before discussing the methods of preparing for an examination, let's establish the exam's purpose. A license examination is one measure used to determine the competency and qualifications of persons licensed to serve aboard a vessel in a particular capacity. To maintain the objectivity of the examinations, certain rules and procedures were developed for their administration. We receive many comments on our policy of not disclosing to an applicant the specific questions missed and/or discussing questions and answers. Applicants should note that the examination is not intended to be an educational process. That is, the test is used to evaulate an applicant's knowledge, not to teach an applicant the material that may have been answered incorrectly during the examination. We do encourage applicants to use a Comment/Protest sheet when they feel a question is bad. A question may be protested for any legitimate reason, such as typographical errors, insufficient information, correct answer not shown, ambiguous wording, etc. Protests based solely on the applicant's unfamiliarity with particular technical or nautical words are generally not considered valid since this is part of the question's construction.

STUDY METHODS

Study methods used by applicants generally fall into one of the following categories:

- Studying on one's own using only reference texts.
- Studying on one's own using commercially prepared, question-and-answer study guides.
- Attending a license preparation course.
- Attending a Coast Guard-approved training course.
- Attending a maritime academy.

Studying on one's own using only reference texts.

This method is based on the fact that every license examination has a suggested study bibliography. This list primarily reflects many of the textbooks used by the U.S. Coast Guard Institute examination writers in developing examinations. The idea behind this study method is that if you know everything in the books, then you will pass the examination. This is, of course, easier said than done. Persons using this approach have had mixed results. The obvious drawback is that the books represent a huge body of knowledge that must be read and assimilated. The Coast Guard does **not** recommend that an applicant purchase every publication on the list solely for examination purposes. Aside from the substantial cost involved, many books cover the same (or similar) material. This is particularly true of publications that would be studied by persons applying for lower level licenses. A more typical use of the study bibliography list is as a supplement to strengthen weak areas in an

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applicant's training or experience.

Studying on one's own using commercially prepared, question-and-answer study guides.

This method is popular with many applicants. The study guides are sold by several publishers for specific licenses, such as Motorboat Operator (Operator of Uninspected Passenger Vessels), Operator of Uninspected Towing Vessels, or Second Mate. The books are often arranged in sections corresponding to the license examination. The questions are similar in style and content to Coast Guard license questions. Study guides are often used to supplement license-upgrade courses taught at several union schools. Persons with broad on-the-job experience and good educational backgrounds have spoken highly of these study guides. However, no matter how comprehensive the guide, it cannot substitute for skills or knowledge gained through service experience. There is a danger, too, in believing that the questions asked on the examination are similar to the ones shown in the study guide. Overdependence on these guides sometimes leads applicants to memorize its questions and answers. However, with the addition or deletion of just one word, two similarly worded questions may require completely different answers. Overall, many applicants have stated that buying study guides was a good investment when compared with buying several reference texts.

Attending a license preparation course.

Licenses preparation courses vary in format and length, but most of them provide an instructor, use questions and answers similar to the actual examinations, augment practice tests with classroom instruction, and assist students in preparing their applications. Variables from course to course may include differences in length, in the degree or extent of instruction, and in the dependence upon a question-and-answer format to prepare applicants. Some courses are taught in a highly structured "class" environment, while others offer a "learn at your own rate" approach. Cost and availability are major determinants for most people in deciding on a license preparation course. A word of caution about these courses is appropriate. Some firms may advertise guaranteed passing as a means to solicit business. A better way to measure the course is by it first-time pass rate for students. Another consideration is whether you want only examination preparation or a more general course. For the latter, a Coast Guard-approved training course may be appropriate.

Attending a Coast Guard-approved training course.

Let's clear up any possible misunderstanding about the term "Coast Guard-approved" in the context of training courses. Coast Guard approval of a course usually means one of two things: either the course is accepted in lieu of a Coast Guard examination, or it allows course graduates to substitute the training for a portion of required service time to qualify for a license. *The Coast Guard does not approve courses whose sole purpose is to prepare students for a license examination.* Also, courses that are accepted in lieu of an examinaton refer primarily to such things as radar observer or blinker-light, not to the actual license examination. However, many applicants find it logical to take an examination upon completion of a training course.

Prior to 1980, Coast Guard-approved courses were mostly those suggested by law or regulation. For example, service requirements for Lifeboatman allow "successful completion of a course of training approved by the Commandant" as qualifying experience. The number of approved training courses has rapidly increased in the last few years, and the Coast Guard encourages formal training for mariners as a means to increase professionalism.

Attending a maritime academy.

Maritime academies are colleges which specialize in preparing students for a career in the maritime industry. A college degree and qualifications for a Third Mate or Third Assistant Engineer's license are gained through the training.

TAKING THE EXAMINATION

Test-taking is a complex subject. The following list is by no means all-inclusive, but it does reflect some areas that many applicants overlook or are unaware of.

Before the Examination:

1. Know what subject areas you are responsible for.
2. Obtain a list of the suggested study bibliography for your examination.
3. Know what the minimum passing score is for each section and the number of questions

per section.
4. Talk to people who have taken the examination before.
5. Do not depend only on rote memorization of questions and answers to get you through the examination. (This is not to imply that the use of questions and answers is necessarily a bad way to study, but it is better not to put "all your eggs in one basket.")
6. Learn what reference materials are allowed on the various examination sections. Try to familiarize yourself with this material beforehand.

During the Examination:

1. Ask how much time you have for each section. (Rarely is a lack of time cited as the reason for poor results.)
2. Make sure you have, or know where, the allowed reference material is.
3. **Always** read the question twice.
4. Mark your answer in the correct spot on the answer sheet. Check this twice. An answer left blank is counted as incorrect.
5. Try to recognize regulatory questions and look the answers up. Don't depend on your memory when the answers are readily available.
6. Use a Comment/Protest sheet when you think a question is bad.

After the Examination:

1. If you pass, congratulations. The examinations are not easy — they weren't intended to be.
2. If you fail, find out which sections will require reexamination.
3. If you fail a particular section badly, ask the examiner to identify the areas you are weak in. Remember, examiners are there to examine, not to teach.
4. Find out when you may take a reexamination.
5. Do not get into an argument with the examiner about the questions. The Comment/Protest sheet is the appropriate place to voice your opinion. Neither you nor the licensing examiner wants to be placed in an adversarial position.

CONCLUSIONS

How you study and prepare for a license examination is, by its nature, a personal decision. No one can tell you which study method is best. Licensing personnel may be able to give you some assistance; however, due to conflict-of-interest laws, examiners cannot recommend a particular course, study guide, or license preparation firm.

FOR ADDITIONAL INFORMATION

Coast Guard-approved courses or license examination study bibliographies: contact a Coast Guard regional examination center.

License preparation courses: check nautical or maritime periodicals in your local library for advertisements.

Question/answer study guides: may be carried by nautical supply stores or bookstores located near regional examination centers. They may be advertised in some places as license preparation courses.

Maritime academies: U.S. Merchant Marine Academy, (516) 482-8200; Texas Maritime Academy, (713) 766-3265; State University of New York Maritime College; (212) 409-7200; Maine Maritime Academy, (207) 326-4311; California Maritime Academy, (707) 644-5601; Massachusetts Maritime Academy, (617) 759-5761; and the Great Lakes Maritime Academy, (616) 946-5650, extension 510. ⚓

Call for Papers

The Ninth International Symposium on the Transport and Handling of Dangerous Goods by Sea and Inland Waterways (TDG-9) will be held in Rotterdam, The Netherlands, from April 13-17, 1987. TDG-9 will provide a forum at which all those involved in the production and movement of dangerous goods can discuss and evaluate the latest scientific and technical advances in the transport of these products by the marine and other interfacing modes. Proposed papers should address one of the following areas: safety in transport and handling, zoning in ports, environmental and legal aspects, training, and new developments.

Additional information can be obtained from and outlines for proposed papers submitted to the TDG-9 Organization at VVV-Congresbureau Rotterdam, Stadhuisplein 19, 3012 AR Rotterdam, The Netherlands. Telex 21228 VVV Nl; telephone (31) 10-14.14.00 ⚓

Wind and Fire

Donald J. Kerlin

It is often the case that maritime casualties reveal the need for additional vessel safety features. Fire safety engineers in Marine Safety Office Charleston (South Carolina) and in Coast Guard Headquarters recently got involved with the investigation of just such a casualty regarding an 83-foot, fiberglass and wood, Subchapter T vessel used in the fishing/ cruise trade. Our on-scene investigation revealed that the installation of a fixed fire-extinguishing system could have precluded the severe engineroom damage caused by fire. In this particular casualty, a 5-hour fire would have been limited to a 5-minute fire, and the resultant damage would have been minimal. A fixed fire-extinguishing system for "T" boats would be a marked improvement in marine fire safety.

During the last week of October 1985, the M/V HURRICANE suffered an engineroom fire while the vessel was engaged in fishing in the vicinity of Myrtle Beach, South Carolina. The vessel was certificated to carry 149 passengers up to 20 miles offshore and 100 passengers up to 100 miles offshore. At the time of the fire, the HURRICANE had 86 passengers and 5 crew aboard. There were no deaths or injuries as a result of this casualty, although there was considerable fire damage to the engineroom.

The fire was caused by an electrical short which ignited the wire insulation together with the combustible ceiling and eventually involved the wooden structural members. The most likely area of ignition was the electrical wiring forward of the starboard engine used for an electrical reel system. Overall firefighting efforts lasted about 5 hours.

The action on the part of the vessel's captain and crew were exemplary. They performed extremely well under adverse conditions, and their efforts resulted in no personnel injuries in what could otherwise have been an extremely bad situation.

As a result of the casualty, recommendations were offered with a view toward future improvement of the applicable Coast Guard regulations, which are contained in 46 CFR Subchapter T. The recommendations concerned better overall firefighting capabilities, and are outlined below:

- using fixed extinguishing systems for enginerooms;
- separating the generator from the engineroom;
- examining hand bilge pump/fire pump inadequacy;
- designing a better cable arrangement for remote engine shutdown (plastic encasement melts and renders the cable useless);
- using noncombustible materials for insulation, ceilings, etc., including within the engineroom;
- not keeping all firefighting apparatus in the engineroom so that a fire in the engineroom will put everything out of operation;
- reviewing the practice which allows a proliferation of plastic pipe in the engineroom;
- reviewing standards associated with wire insulation flammability (need improved insulation flame retardance);
- closing off all ventilation and other openings to engineroom in case of fire;

continued on page 164

At the time he wrote this article, Mr. Kerlin was the Assistant Chief, Ship Design Branch, in the Coast Guard's Marine Technical and Hazardous Materials Division. He has since become the Assistant Division Chief in the Marine Investigation Division.

Ramoncito R. Mariano

Oleum

The average person is not likely to know what oleum is, but the chemical might be better known under another name: highly concentrated or fuming sulfuric acid. Oleum is used in manufacturing fertilizers, pigments and dyes, industrial and military explosives, and detergents. In addition, it is used in petroleum refining and in the plastics industry for manufacturing rayon and cellophane. Sulfuric acid is an electrolyte in lead storage batteries, so many people may come into contact with the chemical if their cars are equipped with this kind of battery.

Oleum is an oily liquid and has a sharp, choking odor. It may range in color from dark brown to colorless. It is shipped in all strengths from 20 percent (104.5 percent) sulfuric acid to 65 percent (114.6 percent sulfuric acid) grade.

Oleum is not flammable, but due to its high reactivity, it still poses a fire hazard. It is capable of igniting finely divided combustible materials on contact. It also reacts violently with water and organic materials, evolving heat in the process. In particular, oleum is extremely hazardous in contact with carbides, chlorates, fulminates, nitrates, picrates, and powdered metals. Flammable hydrogen gas is evolved on contact with metals. Fires involving small amounts of combustibles may be smothered with dry chemicals. The use of water should be avoided as water applied directly to oleum will result in an evolution of heat and splattering.

Any kind of contact with oleum in liquid or mist form should be avoided. The mist is severely irritating to the eyes, respiratory tract, and skin. Inhalation of the mist will cause coughing or difficulty in breathing. When exposure to sulfuric acid mist occurs, the victim should be moved to fresh air. If breathing has stopped, artificial respiration should be given (but not mouth-to-mouth). If there is breathing difficulty, oxygen should be given to the victim.

Exposure to the liquid burns and destroys tissue because of its severe dehydration action. If the acid is dilute, it acts as a milder irritant similar to other acids. As an indication of its effects, a person who was sprayed in the face with liquid oleum suffered skin burns of the face and body, as well as pulmonary edema from breathing the chemical. Additional effects were pulmonary fibrosis, residual bronchitis, pulmonary emphysema, and necrosis of the skin resulting in marked scarring. Severe damage, often leading to blindness, occurs when eyes are splashed with concentrated sulfuric acid. Exposed victims should remove contaminated clothing and flush the affected areas liberally with water. Do not induce vomiting when swallowed. Instead, have the victim drink plenty of water or milk if conscious.

Persons handling oleum should use full protective clothing. This means wearing a respirator approved by the Mine Safety and Health Administration (MSHA) or by the National Institute for Occupational Safety and Health (NIOSH). This also includes wearing rubber gloves, splashproof goggles, rubber footwear, and a face shield.

The U.S. Department of Transportation (DOT) classifies oleum as a corrosive material for purposes of transportation and requires "corrosive" labeling. Open venting and storage at ambient temperature are required when shipping oleum. Containers should be protected against physical damage and water. Detailed packaging and shipping requirements can be found in Part 173 of Title 49 of the Code of Federal Regulations (49 CFR). The International Maritime Organization (IMO) classifies it as a Class 8 chemical. Oleum is also regulated as a Subchapter O commodity in 46 CFR Part 150.

Ramoncito R. Mariano was a Second-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

Chemical name:	Oleum
Formula:	$H_2S_2O_4$-SO_3
Synonyms:	fuming sulfuric acid disulfuric acid pyrosulfuric acid
Physical Properties:	
boiling point:	decomposes
freezing point:	3°C (37°F)
vapor pressure:	
20°C (68°F)	less than 0.001 mmHg
46°C (115°F)	not pertinent
Threshold Limit Values (TLV)	
time-weighted average:	1 ppm; 1 mg/m^3
short-term exposure limit:	5 ppm; 5 mg/m^3
Flammability Limits in Air	not flammable
Combustion Properties	not flammable
Densities	
liquid (water=1):	1.91-1.97 at 15°C
vapor (air=1):	3.4
U.N. Number:	1831
CHRIS Code:	OLM
Cargo compatibility group:	unassigned compatibility group (inorganic acid)

LESSONS FROM CASUALTIES

continued from page 162

— considering a second fire pump located outside the engineroom;

— ensuring that insulation material, including ceilings in the engineroom, are impervious to oil or oil vapors or being enclosed with a material that is [metal clad].

The Coast Guard is considering these recommendations for inclusion in a current regulatory project to revise Subchapter T (CGD 85-080). Additional input was developed as a result of the regulatory project (CGD 85-021) regarding various aspects associated with possible reduction of the structural fire protection requirements of 46 CFR Subchapter T for small, limited route, short duration, high-density, daytime operation passenger vessels. ‡

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. One way to overcome the possibility of a large slug of liquid refrigerant entering the compressor suction while hot gas defrosting is in progress is to install

A. a subcooler.
B. liquid extractors.
C. a re-evaporator.
D. drain lines.

Reference: Dossat, Principles of Refrigeration

2. When cold tappet clearance is less than that specified by the engine manufacturer, diesel engine valves will

A. open earlier than normal.
B. close earlier than normal.
C. remain open for a shorter duration.
D. fail to open when the valves are warm.

Reference: Maleev, Diesel Engine Operation and Maintenance

3. The dimension of the thinnest hydrodynamic fiber developed within a full journal bearing, when all other factors remain constant depends upon the

A. pour point of the lubricant.
B. fluidity of the lubricant.

C. dielectric strength of the lubricant.
D. interfacial tension of the lubricant.

Reference: Gunther, Lubrication

4. In a gravity-type lube oil service system, no oil appearing in the sight flow glass (bulls-eye) while under way, positively indicates

A. no oil is flowing to the bearings.
B. no oil is overflowing the gravity tank.
C. failure of all lube oil pumps.
D. the gravity tanks are empty.

Reference: U.S. Naval Institute, Naval Turbines

5. Which statement is a requirement of Coast Guard regulations concerning emergency diesel engines?

A. The fuel must have a flash point not less than 75°F.
B. They must be capable of operating under full load not less than 30 seconds after cranking.
C. The generator set must lubricate and operate when inclined to specified angles and must be arranged so that it does not spill oil when a vessel rolls 30 degrees either side of the vertical.
D. The starting battery must produce 12 consecutive cranking cycles.

Reference: 46 CFR 112.50-1(g)

DECK

1. Blocks and falls used as lifeboat gear must be designed with a minimum safety factor of

A. 4, based on the breaking strength.
B. 5, based on the maximum allowable strength.
C. 6, based on the maximum working load.
D. 8, based on the normal working load.

Reference: 46 CFR 94.33-5(a)

2. A cloud sequence of cirrus, cirrostratus, and altostratus clouds followed by rain usually signifies the approach of a (an)

A. occluded front.
B. stationary front.
C. warm front.
D. cold front.

Reference: Donn, Meteorology

3. The lower hold of your vessel has a bale cubic of 52,000 cu. ft. You will load a cargo of cases, each weighing 380 lbs. and measuring 3 ft. x 2 ft. x 2 ft. The estimated broken stowage is 15%. How many tons of cases can be loaded?

A. 137 tons.
B. 161 tons.
C. 625 tons.
D. 969 tons.

Reference: Merchant Marine Officer's Handbook

4. Which lights shall a 200-meter vessel exhibit when at anchor?

A. In the forepart of the vessel, a 225-degree white light
B. In the aft part of the vessel, a 112.5-degree white light
C. Any available working lights to illuminate the decks
D. In the forepart of the vessel, a 112.5-degree white light

Reference: COMDTINST M16672.2A

5. In special cases, the Commandant of the Coast Guard may permit cargo piping to pass through machinery spaces, provided that the only cargo carried through such piping is

A. grades A or B.
B. grades D or E.
C. grade E.
D. LFG.

Reference: 46 CFR 32.50-15(3)

ANSWERS

ENGINEER
1-C;2-A;3-B;4-B;5-C
DECK
1-C;2-C;3-C;4-C;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

GREENSBORO Exhibit

The Greensboro (North Carolina) Historical Museum is attempting to locate anyone who served on the USS GREENSBORO, a Navy patrol frigate in World War II with a Coast Guard crew.

If you have memories to share, call the museum at (919) 373-2043, or write Howard Hendricks, Greensboro Historical Museum, 13 Summitt Street, Greensboro, NC 27401.

This project is being undertaken to develop a USS GREENSBORO exhibit.

Keynotes

Final Rule

CGD 84-022, Bridge Lighting and Other Signals (May 2)

This rule revises the bridge lighting regulations by adding standards for retroreflectors, daymarks, fog signals, vertical clearance gauges, radar reflectors, racons, and other signals. Due to a history of accidents involving vessels hitting bridges, the old regulations, which refer only to bridge lighting, needed to be expanded to include means of signaling in daylight or fog and of informing vessel operators of the vertical clearance at bridges. These amendments are intended to promote safe navigation through bridges across the navigable waters of the United States. This rule is effective on June 2, 1986.

CGD 85-060, Inland Waterways Navigation Regulation; Connecting Waters from Lake Huron to Lake Erie (May 8)

This rule amends the existing Inland Waterways Navigation Regulations for the connecting waters between Lake Huron and Lake Erie. This amendment results from the Coast Guard's commitment to industry to review the reporting point requirements after a period of experience of two seasons of operation under the current rules. The amendment will maintain the existing level of safety while reducing the burden of compliance on marines and ship owners. The effective date is May 28, 1986.

CGD 84-067, Oil and Hazardous Discharge Reporting Requirementss (May 16)

This final rule amends the procedures for reporting discharges of oil and hazardous substances as required by Section 311 of the Federal Water Pollution Control Act, as amended (FWPCA), revises or deletes outdated language, and clarifies criteria for direct payment from the Pollution Fund. The intended effect of this rule is to assure consistency of this Part with the statutory provisions of the FWPCA, the regulatory requirements of the National Contingency Plan, and the statutory reporting requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. The effective date is June 16, 1986.

CGD 84-069b, Lifesaving Equipment; Thermal Protective Aids (May 29)

The Coast Guard is adopting specifications for approving thermal protective aids. A thermal protective aid is a bag or suit made of waterproof material with low thermal conductivity. It is required by the Second Set of Amendments to the International Convention for the Safety of Life at Sea (SOLAS 74/83) to be carried in a liferaft, lifeboat, or rescue boat to provide protection against hypothermia. These specifications are necessary so that the Coast Guard may approve thermal protective aids to be carried aboard U.S. vessels on an international voyage. The effect of the regulations will be to provide guidance to potential manufacturers of the devices so that they can design a product to fulfill the requirements of SOLAS 74/83, and to provide a vehicle for approval of the devices as required by SOLAS 74/83. The effective date is June 30, 1986.

CGD 85-015, Vessel Reporting Requirements (May 29)

The Coast Guard is amending the shipping regulations by adding requirements to give the Coast Guard prior notification of vessel inspections and to give immediate notification to the Coast Guard if there is reason to believe a vessel is in distress. These regulations apply to individuals in charge of a vessel, including vessel owners, charterers, operators, agents, and masters. These regulations implement the reporting requirements of the Maritime Safety Act of 1984. Their purpose is to enhance maritime safety by insuring vessels will be reinspected for certification and also by increasing the likelihood that timely assistance will be provided to vessels in distress. These rules become effective on May 29, 1986.

Termination Notice

CGD 85-001A, Individual Participation in Marine Safety Reporting Program (MSRP); Enforcement Policy (May 29)

On June 1, 1985, the Office of the Secretary, Department of Transportation, initiated a one-year, voluntary Marine Safety Reporting Program (MSRP). As part of this program, the Coast Guard agreed not to impose a civil penalty for certain offenses if a report was filed with MSRP. Title 33, Section 1.07 sets forth Coast Guard enforcement policy for participation in the MSRP. This notice announces the termination of the one-year test and removes references to the MSRP from 33 CFR 1.07. The effective date is June 15, 1986.

Notice of Proposed Rulemaking

CGD 78-038, Liquefied Natural Gas Waterfront Facilities (May 16)

The Coast Guard proposes safety standards for the design and construction, equipment, operations, maintenance, personnel training, firefighting, and security at liquefied natural gas waterfront facilities. These regulations implement the Ports and Waterways Safety Act of 1972, as amended, and are necessary to prevent or mitigate the results of an accidental release of liquefied natural gas at a liquefied natural gas waterfront facility. They would reduce the possibility that such an accident could occur, and would reduce the damage and injury to persons and property should an accident occur. Comments must be received on or before August 14, 1986.

CGD 86-020, Great Lakes Pilotage Rates (May 23)

The Coast Guard is proposing to amend the Great Lakes Pilotage Regulations. These amendments propose an increase in the basic pilotage rates of thirteen percent in District 1 and six percent in District 3. No change is proposed in District 2. These changes are proposed in order to increase the revenue received by the pilot organizations so that they may meet their operating costs. They also provide for comparability between the three Districts regarding the recognition of the types of expenses incurred in providing pilotage services.

CGD 85-002, Boating Safety; Certification and Safe Powering Standards (May 29)

This notice proposes amendments to the Certification regulations in Subpart B of Part 181 and the Safe Powering Standard in Subpart D of Part 183 of Title 33, Code of Federal Regulations. The intended effect of the proposal is to give those boats, which can clearly operate safely with more horsepower than they currently rate under the Coast Guard Safe Powering Standard, more reasonable maximum horsepower capacities. In order to allow greater flexibility in the manner in which the maximum horsepower capacity of these boats is determined, the proposal would establish an optional performance test method as an alternative to the existing calculation method. An additional editorial change to Subpart A of Part 181 would reflect changes in the applicability of the part. Comments must be received on or before July 29, 1986.

Advance Notice of Proposed Rulemaking

CGD 84-099 and 099A, Operation of a Vessel While Intoxicated (May 23)

These notices propose regulations designed to monitor, control, and reduce alcohol and drug use in both recreational vessel operation and commercial marine operations, including operations of the Outer Continental Shelf and at deepwater ports. Recent legislation provides civil and criminal penalties for an individual who is intoxicated while operating a vessel, as determined under standards prescribed by the Secretary. The proposals are based on the belief by the Coast Guard that alcohol and/or drugs are involved in a substantial number of recreational boating casualties and contribute to numerous commercial marine casualties. The proposals are intended to reduce recreational and commercial marine casualties caused by intoxication. Comments must be received on or before August 21, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours. ⚓

From the Editor

Once again, we are looking for ways to conserve those all-important budget dollars. In our next issue of **Proceedings,** *we plan to include a tear-out postcard which readers may use to continue their subscriptions to this magazine. Please watch for the postcard -- if we don't receive one from you, we won't be able to continue sending you the* **Proceedings** *each month. Full details will appear in our next issue.* ⚓

Sharon Chapman

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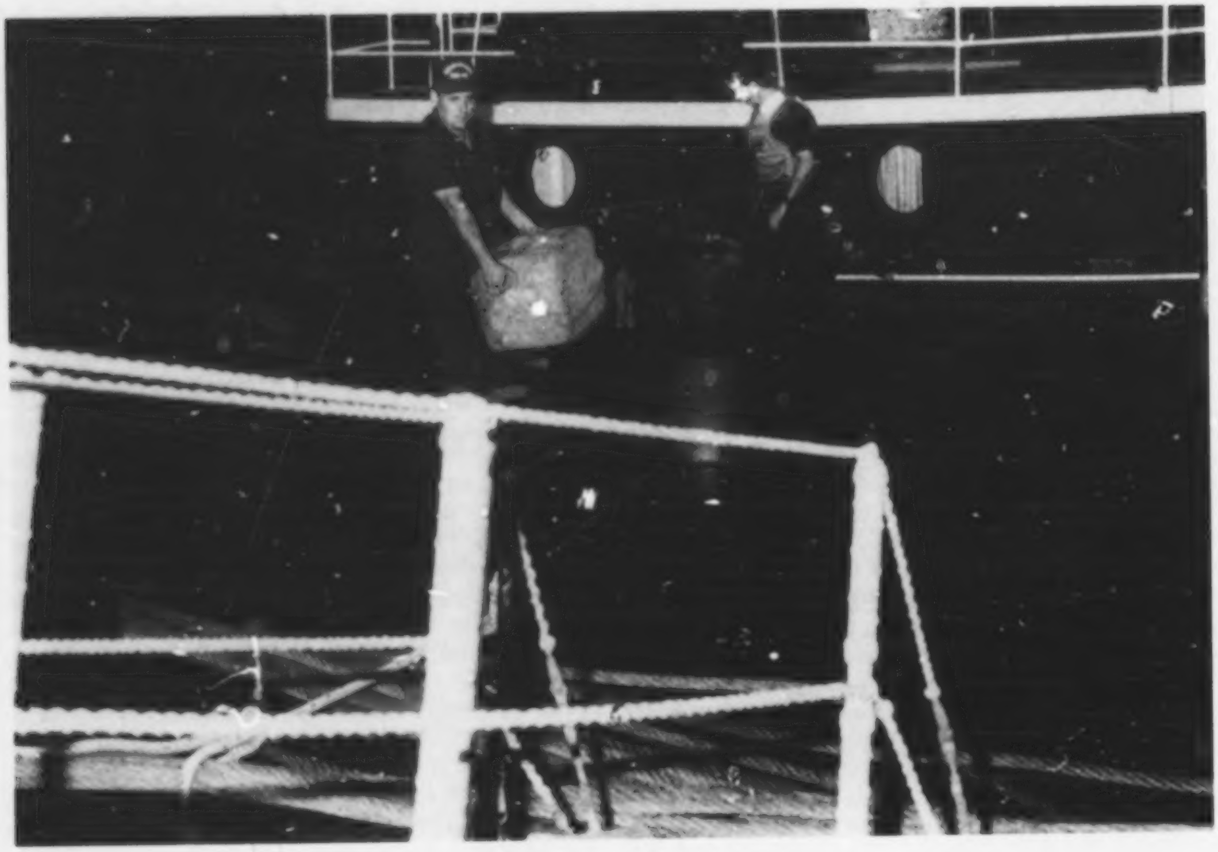

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Commandant

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Cover

Our cover photo shows Coast Guard personnel unloading marijuana from a seized vessel. In addition to its drug interdiction efforts, the Coast Guard acts to revoke licenses and Merchant Mariner's Documents from seamen who use drugs. "Drugs and the Merchant Mariner" begins on page 171. (Official U.S. Coast Guard photo by PA2 Kathi Boatman, Fifth District)

Drugs and the Merchant Mariner

LCDR Christopher Walter

Editor's Note: Although the author's theme centers on drug abuse, the Coast Guard believes alcohol abuse poses an equally important threat to the safety of the vessel. Accordingly, the Coast Guard has issued a comprehensive Notice of Proposed Rulemaking in the Federal Register, Vol. 51, No. 100, dated May 23, 1986. This Notice is designed to monitor, control and reduce alcohol and drug abuse aboard vessels. It proposes standards applicable to commercial vessels and vessels subject to statutory manning requirements for determining intoxication caused by alcohol or drugs, either based on a percentage of alcohol in the blood or on observations of the individual's demeanor or performance. Standards applicable to recreational vessels are being addressed in a separate rulemaking (CGD 84-099A). In addition, the Coast Guard is proposing (1) to prohibit crew members on vessels subject to inspection from performing any duties while intoxicated or within 4 hours of consuming any alcohol; (2) civil penalties for owners, charterers, managing operators, agents, master, or individuals in charge of vessels subject to inspection that allow crew members to perform any duties while intoxicated; (3) to allow personnel licensed, documented, or certificated by the Coast Guard to seek rehabilitation prior to being subject to proceedings to suspend or revoke the license, certificate, or document; (4) to provide for toxicological testing of individuals; and (5) to amend the regulations requiring reports of all marine casualties to include specific information on the role of alcohol or drugs in the casualty.

The proposals, if adopted, will aid the Coast Guard in providing for safety at sea by ridding vessels of alcohol and drug abusers. Interested persons are encouraged to review the Notice and submit comments.

LCDR Walter is Chief of the Investigation Department, U.S. Coast Guard Marine Safety Office, Hampton Roads, Virginia.

On January 10, 1985, an Able Seaman (AB) on a U.S. documented freighter did not relieve the watch on time. The vessel's Chief Mate searched for the AB and found him on the mess deck in a comatose state. His pockets were searched, and several vials containing a white powder were found. Fearing that the AB was suffering from a drug overdose, the Master had the seaman supported and walked around until he appeared to recover. A subsequent search of the seaman's room also produced a leafy vegetable matter which resembled marijuana. The vials and the suspected marijuana were given to U.S. Customs Service agents upon the vessel's arrival in Norfolk, Virginia; field tests proved positive for both heroin and marijuana. The seaman was charged by Coast Guard Investigating Officers under the provisions of Title 46 United States Code (U.S.C.) 7703 for misconduct, possession of heroin and marijuana, and his Merchant Mariner's Document was revoked in a hearing before an Administrative Law Judge. Customs levied an administrative fine against the AB which totaled $675.

On the same voyage, another AB on the vessel was logged by the Master for possession of marijuana. When the field test conducted by a U.S. Customs agent proved positive for marijuana, the seaman was charged by the Coast Guard under the provisions of 46 U.S.C. 7703 for misconduct, possession of marijuana, and his Merchant Mariner's Document was revoked, also. Customs fined this seaman a total of $75.

In each of the above cases, evidence presented by the Coast Guard Investigating Officers during the suspension and revocation hearings against the seamen's documents revealed that the conduct of these seamen had diminished their performance and endangered their vessel and its crew.

During the search of this vessel by U.S. Customs, a drug-sniffing dog "alerted" in the room of a third person. There appeared to be a minute amount of hashish residue left in an ashtray. Since the amount present was not sufficient to support any suspension and revocation charges or administrative fines by Customs agents against that seaman, neither Customs nor the Coast Guard took any official action. She was given a verbal warning, however, in the hope this action would be sufficient to prevent future involvement with drugs.

In March 1985, 12 men were indicted by a federal grand jury in Norfolk, Virginia, for smuggling 69.5 **tons** of marijuana valued at $23.5 million from Colombia into North Carolina and Virginia. The indictment charged that this smuggling operation ran from 1979 through 1982. Marine Safety Office Hampton Roads Investigating Officers read about the indictments in the local newspaper and, after checking with Coast Guard Headquarters, they found that 3 of the 12 men were holders of Coast Guard licenses or Merchant Mariner's Documents. Two of the men were convicted of violating drug laws; the third remains a fugitive from justice. The two who were convicted and are presently serving sentences in prison voluntarily surrendered their Merchant Mariner's Documents (the equivalent of a revocation) in lieu of appearing at a hearing.

A careful reading of the local newspaper also resulted in a suspension and revocation case involving a man with a license as an Operator of Uninspected Towing Vessels. In this case, the man was convicted of violating drug laws in conjunction with the smuggling of 37,000 pounds of hashish into the United States. He was charged for violation of a dangerous drug law, and his license was revoked in a hearing before an Administrative Law Judge in Norfolk, Virginia. He is presently serving a sentence in prison.

In March 1985, the owners of a U.S. documented vessel required all the members of the crew to submit to a drug urinalysis test or be fired. The test results for 19 of the crew were positive for a number of drugs, and those crew members were discharged. Additional tests were run on the replacement crew, and eight of them also failed the drug screening. The crew members who failed the drug urinalysis test are the subjects of a Coast Guard suspension and revocation investigation for misconduct and use of dangerous drugs. Coincidentally, the seaman first mentioned in this article, the one who possessed vials of a white powder, had also signed onboard this vessel. The service of the Administrative Law Judge's decision revoking his Merchant Mariner's Document took place on this vessel and was totally independent of the company's decision to require the urinalysis tests.

In September 1985, Virginia Beach (Virginia) police arrested a man for assault. When they searched the suspect after the arrest, they found what appeared to be marijuana. The suspect complained bitterly that he was being harassed by the police and, while at the police station, pulled a Merchant Mariner's Document from his wallet, threw it at the police officer, and yelled, "While you're at it, why don't you check this for cocaine?" The police took the Merchant Mariner's Document and found a white powder inside it where the plastic lamination over the card had separated; the powder was analyzed and proved to be cocaine. Apparently, the individual had been using his Merchant Mariner's Document to cut lines of cocaine. Several months before, Marine Safety Office Hampton Roads had sent a letter to each law enforcement agency in the area, asking to be notified of any drug-related arrests of persons with Merchant Mariner Documents or licenses. The Virginia Beach police called Marine Safety Office Hampton Roads, and this seaman's Merchant Mariner's Document was revoked by an Administrative Law Judge.

Legislative History

Title 46 U.S.C. 7704 provides for the mandatory revocation of a seaman's license, document, or certificate of registry for conviction of a dangerous drug law or for use of or addiction to dangerous drugs. The legislative history for 46 U.S.C. 239b, which was replaced by 46 U.S.C. 7704 when Title 46 was recodified, gives some interesting background and history for the law requiring revocation for involvement with drugs. The Coast Guard representative at the Senate hearing on the Act of July 15, 1954 (which was to become 46 U.S.C. 239b) testified that "in the last few years it has become evident that a large number of convicted addicts and/or traffickers are now able to serve in the United States Merchant Marine to the detriment of shipboard safety, morale and discipline because (presently) we are unable to proceed against them for narcotics offenses ashore."[1] The witness from the Bureau of Narcotics[2] testified that most drug smuggling is done by merchant seamen of all nations and that "A person who has been convicted of a narcotics offense or who has been addicted to narcotic drugs is a definite hazard insofar as the smuggling of narcotics is concerned."[3] The original law, passed in 1954, dealt with narcotics as defined by 21 U.S.C. 171(a) as well as marijuana. When Title 46 was recodified, the scope of the law was expanded to dangerous drugs as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970 (21 U.S.C. 802). This was done to incorporate violations of drug laws and misconduct involving drugs such as PCP and LSD[4] which, while not narcotics or marijuana, constitute definite hazards to safety at sea when a mariner is involved with them.

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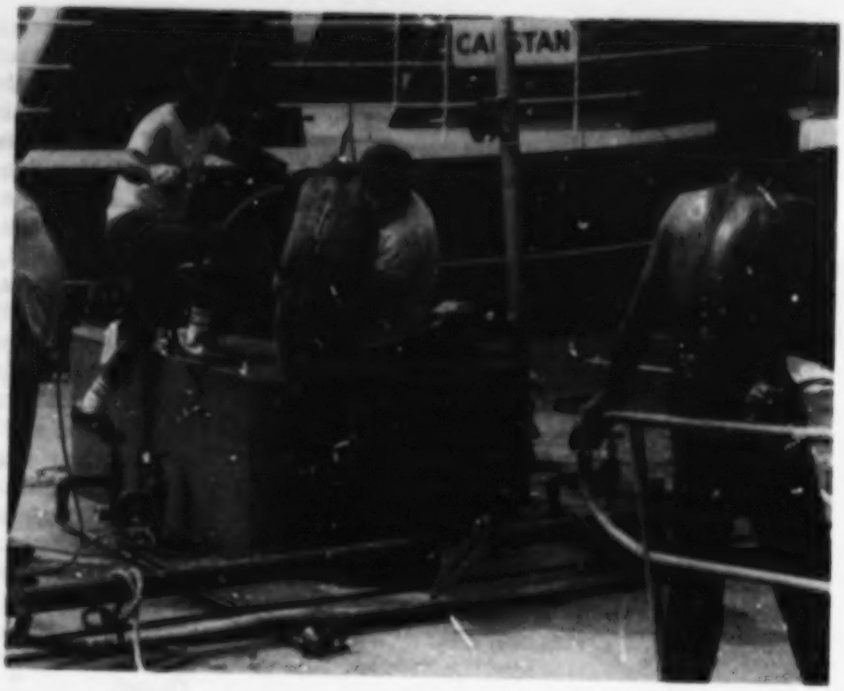
[1] *Senate Report No. 1648, 83rd Congress, 2nd session, reprinted in 1954, U.S. Code Congressional and Administrative News, p. 2558-9.*



This vessel was turned over to the U.S. Customs Service and the Drug Enforcement Administration when the Coast Guard brought it into port. A commercial moving company was hired by DEA to remove bundles of marijuana from the seized vessel. (Official U.S. Coast Guard photo by PA2 Kathi Boatman, Fifth District)

On February 4, 1985, the Coast Guard published an Advance Notice of Proposed Rulemaking (ANPRM) in the Federal Register concerning the possible revision of Title 46 Code of Federal Regulations (CFR) Part 12. These regulations cover the requirements for certification of seamen. The ANPRM background information stated, in part, "The growth in the use and abuse of narcotics and alcohol in society has drawn national attention to the safety problems associated with persons under the influence of such drugs. This safety problem is greatly increased aboard ship and persons under the influence pose hazards to both ship and crew."[5] The ANPRM went on to request comments on a number of areas, including (1) if physical examinations are required for original Merchant Mariner's Documents at the entry level, should drug/alcohol screening also be required; and (2) if retention physical examinations are required, should drug/alcohol screening be included?[6]

This ANPRM appears to be the first shot in a new battle to keep the Merchant Marine free of drug use. Other transportation modes have either taken measures to reduce the hazards from drug use or have received recommendations to institute measures to detect and control drug use. The National Transportation Safety Board (NTSB), an independent federal agency which is tasked with promoting transportation safety by conducting accident investigations and by formulating safety improvement recommendations, issued three drug-related recommendations to the Federal Aviation Administration on August 15, 1985, as a result of a fatal aviation accident. One of these recommendations was as follows:

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[2] *Now known as the Drug Enforcement Administration.*

[3] *Senate Report No. 1648, 83rd Congress, 2nd session, reprinted in 1954, U.S. Code Congressional and Administrative News, p. 2559.*

[4] *House of Representatives Report No. 98-338, 98th Congress, 1st Session, reprinted in 46 U.S. Code Annotated, Subtitle II, 1985, West Publishing Co., St. Paul, Minnesota, p. 375.*

[5] *50 Federal Register 23, 4876, 1985.*

[6] *50 Federal Register 23, 4876, 1985.*

Establish at the Civil Aeromedical Institute the capability to perform state-of-the-art toxicological tests on the blood, urine, and tissue of pilots involved in fatal accidents to determine the levels of both licit and illicit drugs at both therapeutic and abnormal levels.

Similarly, NTSB, on March 7, 1983, issued the following recommendations to the Federal Railroad Administration as a result of several fatal railroad accidents:

Immediately promulgate a specific regulation with appropriate penalties prohibiting the use of alcohol and drugs by employees for a specific period before reporting for duty and while on duty.

and

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate effective procedures to ensure that timely toxicological tests are performed on all employees responsible for the operation of the train after a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage.

Table 1

	1982	1983	1984	1985
Total Hearings With Guilty Findings and Total Voluntary Surrenders	301	251	249	801
Revocations and Voluntary Surrenders for Drugs Alone	29	17	32	78
Sentences Involving Less Than Revocation for Drugs Alone	8	8	7	23
Total Guilty Findings and Voluntary Surrenders for Drugs Alone (sum of rows two and three above)	37	25	39	101

In the midst of this concern about drug use by persons employed in the transportation industry, the Coast Guard continues to seek the revocation of licenses and documents of mariners who use dangerous drugs or are convicted of violating dangerous drug laws. The following table shows the number of suspension and revocation hearings conducted by the Coast Guard for 1982, 1983, and 1984 along with voluntary surrenders to avoid a hearing. This table also shows the number of revocations and voluntary surrenders for drug offenses as well as sentences of less than revocation (where the defense can prove that marijuana use was experimental and not likely to recur, the Administrative Law Judge has the discretion to enter an order against the mariner's license or document that is less than revocation. As table 1 shows, orders of less than revocation for marijuana experimentation are rare.) These figures for dangerous drug-related revocations are very likely to increase if screening for drugs is instituted by unions, companies, or the Coast Guard.

Suspension and revocation actions and voluntary surrenders for drugs are a small part of the total in table 1. This is due primarily to the secretive nature of drug use and the lack of information available to the Coast Guard about mariners using drugs and being convicted for violation of dangerous drug laws. Part of this is also due to the reluctance of masters and other personnel in the industry to take action and report drug use on vessels to the Coast Guard. It is very likely that the total number of guilty findings at suspension and revocation hearings and voluntary surrenders for drugs only represent a small part of the involvement with drugs on the part of merchant mariners in this country. For example, the urinalysis tests required of the crew on the previously mentioned vessel revealed that a large number of the crew were using illicit drugs. These urinalysis tests, by themselves, could account for most of the Coast Guard's suspension and revocation actions for drug involvement for an entire year. Unless the mariner is convicted of violating a dangerous drug law and the Coast Guard becomes aware of it through the news media or liaison with other agencies or unless the vessel's master or owner reports drug use on a vessel, the Coast Guard will not have the information to take action against a mariner's license or document. This lack of information accounts for the limited number of suspension and revocation actions for drugs.

What does the future hold for this problem of drug use in the Merchant Marine? First, it is plain to see that the handwriting is on the wall for merchant mariners who are users of drugs. The provisions of the law regarding drug involvement on the part of applicants for or holders of Coast Guard issued licenses and documents, first in 46 U.S.C. 239b and now in 46 U.S.C. 7704 — to deny or revoke the licenses and Merchant Mariner's Documents of those who use or are addicted to drugs or are convicted of violating a dangerous drug law — are likely to be supplemented by screening for drugs when making application for documents and at periodic physical examinations. Second, mandatory drug screening after accidents may spread from other transportation modes to the marine field. Also, companies are likely to make use of drug screening to enhance the safety of their vessels by eliminating drug users from the crew; shipping companies may very well have the cooperation of the maritime labor unions, too. And, finally, the Coast Guard will continue to seek the revocation of licenses and Merchant Mariner's Documents of seamen who are associated with dangerous drugs. ‡

The author wishes to thank the following persons for their assistance with this article: LCDR David Wallace and LT Phillip Corpuz (Marine Investigation Division, Coast Guard Headquarters), LTJG Sean Connaughton (Merchant Vessel Personnel Division, Coast Guard Headquarters), LCDR Walter Brudzinski (Fifth Coast Guard District), LCDR Timothy Healey (Marine Safety Office Baltimore), and LT William Uberti, (Marine Safety Office Hampton Roads).

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International Convention for the Safety of Life at Sea

Of all the international conventions dealing with maritime safety, the most important is the International Convention for the Safety of Life at Sea (SOLAS).

It is also one of the oldest, the first version having been adopted at a conference held in London in 1914. The incident which led to the convening of the 1914 Conference was the sinking of the TITANIC on its maiden voyage in April 1912 when more than 1,500 passengers and crew died.

Since then, there have been four more versions of the SOLAS Convention: the second was adopted in 1928 and entered into force in 1933; the third was adopted in 1948 and entered into force in 1952; the fourth was adopted (under the auspices of IMO) in 1960 and entered into force in 1965; and the present version was adopted in 1974 and entered into force in 1980.

The 1974 Convention is unlikely to be replaced by a new instrument because it can be amended by the new procedure which is included in article VIII.

A series of accidents involving oil tankers in the winter of 1976-1977 led to increasing pressure for further international action. As a result, early in 1978 IMO convened an international conference on tanker safety and pollution prevention which adopted a number of important modifications to SOLAS as well as to the International Convention for the Prevention of Pollution from Ships (MARPOL), 1973.

During the 1970s the Organization prepared a number of major changes to the 1974 Convention, some of which were incorporated in the 1978 Protocol. Others were included in amendments adopted on 20 November 1981 and, under the tacit acceptance procedure, entered into force on 1 September 1984.

The second set of amendments to the SOLAS Convention was adopted by IMO's Maritime Safety Committee on 17 June 1983 and is expected, under the tacit acceptance procedure, to enter into force on 1 July 1986.

On 17 June 1983 the Maritime Safety Committee also adopted the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)*[1] and the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IBC Code).*[2] The 1983 amendments (parts B and C of chapter VII) make these codes mandatory under this Convention.

In order to provide an easy reference to all SOLAS requirements applicable from 1 July 1986, the 1986 publication contains a consolidated text of the 1974 SOLAS Convention, the 1978 SOLAS Protocol, and the 1981 and 1983 SOLAS amendments.

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[1] Sales number 100.83.11.E, price £3.75.

[2] Sales number 104.83.12E, price £4.50.

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The Tug CELTIC and Barge CAPE RACE

The Accident

On October 27, 1984, the empty scrap barges CAPE RACE and HERBERT E. SMITH were towed to the loading berth at the Jacob Brothers, Inc. (Jacob) scrapyard in Bridgeport, Connecticut, to receive a load of scrap iron. The owner of the barges had specified that the barges would be loaded so as to have a freeboard of 5 feet, which would allow about 1,400 long tons of cargo to be loaded. The CAPE RACE was moored alongside the berth and would be loaded first, and the HERBERT E. SMITH was moored outboard of the CAPE RACE. When loading of the CAPE RACE was finished on November 8, 1984, the barges were turned around together so that the HERBERT E. SMITH was alongside the berth.

About 1200 (Eastern Standard Time) on November 9, 1984, loading of the HERBERT E. SMITH was begun. About this time the crane operator noticed that the HERBERT E. SMITH was listing and notified the yard foreman. The foreman notified the M.J. Rudolph Corporation (Rudolph), owners of the HERBERT E. SMITH, that the barge apparently was leaking and required repairs. A welder who was one of seven repairmen regularly employed by the barge owner to perform continuing repairs to barges was sent to the scrapyard to find out what was wrong with the HERBERT E. SMITH. The welder recalled that he probably arrived at the scrapyard on November 12, 1984. The welder located a leak in the after rake compartment of the HERBERT E. SMITH. At his request, scrap iron was loaded forward in the barge to raise the stern and bring the leaking area out of the water. The welder found two 1/4-inch-wide cracks, one 5 inches long and the other 6 inches long. He welded both cracks, and loading was resumed.

While the welder was at the scrapyard, he also checked on the condition of the CAPE RACE. The welder recalled that he probably inspected the CAPE RACE for the first time on November 12, 1984. He found approximately 5 feet of water in the forward rake compartment, which he pumped out. He walked through the three void compartments on each side of the cargo compartment, where he found only a small amount of fresh water in the double bottoms. He stated that it was probably rainwater that had entered the void compartments through holes in the cargo compartment. He stated that there were numerous holes — some 1 foot or more in diameter — in the deck and sides of the cargo compartment. He stated that the bucket, a large grapple device used for unloading the barges, sometimes punched holes or made cracks in the cargo compartment.

The welder said that he again inspected the barges the next day, probably November 13. This time he found that approximately 1 foot of water had leaked into the forward rake compartment of the CAPE RACE. An inspection revealed that water was entering the compartment through a leak in the shell plating of the bow rake approximately 1/2 foot inboard from the starborad side and about 10 feet from the bottom of the barge. The welder removed a large piece of scale, about 1/4-inch thick and about 1 foot in diameter, in the area of the leak. Removal of the scale exposed a hole about 3/4-inch in diameter, through which a stream of water was leaking into the compartment. The welder drove a round, tapered, wooden plug into the hole, which stopped the leak. He again pumped out the water, except for about 1 inch that was below the suction capability of the pump hose. The welder said that he checked the barges on November 14 and found that they were not leaking. Loading of the HERBERT E. SMITH was completed at 1100 on November 17, 1984.

About 0310, on November 17, 1984, the U.S. tug M/V CELTIC, with a six-man crew, got

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This article was taken from the National Transportation Safety Board's Marine Accident Report No. NTSB/M AR-85/12.

underway from Port Newark, New Jersey, with the hopper barge CAPE BARBARA. The tug was under orders to tow the empty barge to the Jacob scrapyard, pick up the CAPE RACE and HERBERT E. SMITH, and tow the barges from the scrapyard to Port Newark.

Shortly after arrival in Bridgeport, the CELTIC's crew moored the CAPE BARBARA at the Union Square Dock at 1115, and the CELTIC proceeded the short distance across Bridgeport Harbor and entered Yellow Mill Channel, arriving at the scrapyard at 1220. (See figure 1.) One of the loaded scrap barges at the loading berth was aground, so the CELTIC's captain decided to wait for the tide to rise. About 1445, the tug got underway towing the CAPE RACE and HERBERT E. SMITH astern. The CELTIC's crew moored the two barges at Cilco Wharf at one of the deepwater berths for oceangoing ships. The bridge tender at the nearby Pleasure Beach Bridge stated that one of the barges had a list before the two were moored at the Cilco Wharf and that he notified the CELTIC's captain of the list on VHF-FM channel 13. The CELTIC's captain replied that he was aware of the list. The CELTIC returned to Union Square Dock to pick up the CAPE BARBARA to resume its delivery to the scrapyard. By 1610, the CAPE BARBARA was moored at the scrapyard loading berth, and the CELTIC proceeded out of Yellow Mill Channel en route to the Cilco Wharf.

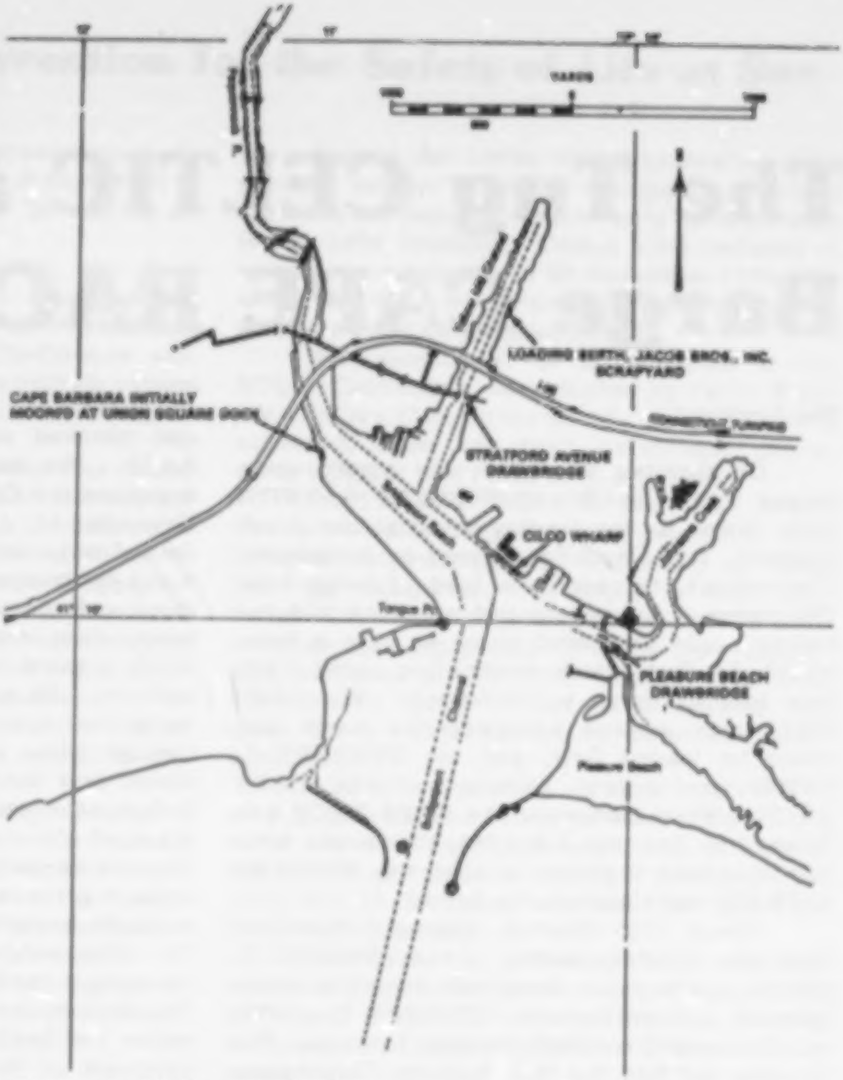
YARDS
LOADING BERTH, JACOB BROS., INC. SCRAPYARD
CAPE BARBARA INITIALLY MOORED AT UNION SQUARE DOCK
CONNECTICUT TURNPIKE
STRATFORD AVENUE DRAWBRIDGE
CILCO WHARF
Tongue Pt.
PLEASURE BEACH DRAWBRIDGE
Pleasure Beach

Figure 1. Bridgeport Harbor.

Upon arriving alongside the CAPE RACE and HERBERT E. SMITH, about 1630, the CELTIC's crew attempted to pump water from the HERBERT E. SMITH to correct its list, but this effort was unsuccessful. About 1815, the CELTIC's mate asked the bridge tender at the Pleasure Beach Bridge to open the drawbridge in Yellow Mill Channel because one of the barges was sinking and had to be returned to the scrapyard. The bridge tender arranged for the Yellow Mill bridge tender to be called in to operate the drawbridge across Yellow Mill Channel, since the bridge was not manned at that time. The Yellow Mill bridge tender arrived and opened the drawbridge at 1910, and the CELTIC with the HERBERT E. SMITH immediately passed through. After mooring the HERBERT E. SMITH to pilings south of the scrapyard loading berth, the CELTIC departed at 1940 to return to the Cilco Wharf to pick up the CAPE RACE.

About 1945, the mate of the CELTIC called the ferry vessel GRAND REPUBLIC on channel 13 to inquire about weather conditions in Long Island Sound. The captain of the GRAND REPUBLIC informed him that the seas were 3 feet high and decreasing and that the seas were from the west. Later, the mate spoke with another tug about weather and sea conditions in Long Island Sound. The operator of that tug stated that the weather was improving and that he was pushing a barge ahead. By 2000, the CAPE RACE was secured to the CELTIC, and the tow got underway from the Cilco Wharf en route to Port Newark via Long Island Sound. The bridge tender at the Pleasure Island Bridge saw the tow get underway. He stated that the barge had about 3 to 4 feet of its hull above the water and that the barge appeared to be "level." He stated that he could see lights, including a red light, on the tug but no lights on the barge. He stated that the tug appeared to be pushing the barge.

At 2100, the CELTIC's mate called the dispatcher at the offices of the Eklof Marine Corporation (Eklof), the tug's operator, in Staten Island via the marine operator. The mate reported that only one barge, the CAPE RACE, was in tow. He stated that the HERBERT E. SMITH was leaking and had assumed a list, and that because efforts to pump the barge had not been successful, the barge had been returned to the Jacob scrapyard. He stated that there was no further problem and that he would call the Eklof office in the morning.

Nothing further was heard from the CELTIC.

When the CELTIC did not arrive at Port Newark the next morning, November 18, 1984, the Eklof dispatcher on duty attempted unsuccessfully to contact the tug on VHF-FM channel 5, a channel used by the Eklof office and vessels. At 1218, the Eklof dispatcher notified the U.S. Coast Guard that the CELTIC and CAPE RACE were overdue and requested the Coast Guard to search for the vessels.

At 1343, on November 18, 1984, the Coast Guard issued an urgent radio broadcast informing mariners that the CELTIC and CAPE RACE were overdue. The broadcast provided a description of the vessels and requested mariners to keep a sharp lookout for the vessels and to report any contact to the Coast Guard. The Coast Guard requested various police departments to check all harbors where the CELTIC might have sought refuge and then began attempts to contact the CELTIC on VHF-FM channels 16 and 13.[1] Later in the afternoon, Coast Guard helicopters searched Long Island Sound along the CELTIC's route. All efforts to locate the tug and barge were unsuccessful, and by late that evening, the Coast Guard requested the National Weather Service to broadcast after every routine marine weather report a description of the overdue vessels and a request that mariners keep a sharp lookout, render assistance as required, and report any contact to the Coast Guard.

On November 19, 1984, three Coast Guard cutters, SAUK and WIRE from New York, New York, and BOLLARD from New Haven, Connecticut, joined the search for the tug and barge. Coast Guard helicopters also resumed searching. The search units were directed to look especially for a liferaft, oil slick, debris, and personnel in the water. At 0752, the SAUK observed an oil slick on the water of Long Island Sound about 6 miles south of Norwalk, Connecticut. At 0810, a Coast Guard helicopter, which the SAUK had directed to assist in investigating the slick, observed a large fiber line, believed to be a towing hawser, floating below the surface.

By 0830, the SAUK had located the origin of the oil slick about 2 miles to the northeast of the original sighting. At this location, oil and air could be observed rising from below the surface. About 0900, the passing fishing vessel MOONSHINE volunteered to assist the search by transiting the area while operating its fathometer, which was equipped with a graph recorder. At 0910, the MOONSHINE's fathometer located the CELTIC about 40 feet below the surface. The Coast Guard sought diver assistance from the marine police in Norwalk and Bridgeport, and the police departments in both cities agreed to provide divers to attempt to locate and rescue survivors. Divers from the Norwalk marine police arrived at 1020 and began diving operations at 1047. The divers found the floating line and used it to descend to the CELTIC. They found two bodies in the pilothouse and then conducted a tapping survey of the hull to determine if anyone was trapped inside. There were no replies to the tapping noises made by the divers. The body of the mate was removed from the pilothouse and brought to the surface at 1110, and a few minutes later the body of the chief engineer was recovered from the upper engineroom.

The divers initially reported that the CELTIC was resting on the bottom, upright but listing 10° to port, and was heading east to northeast. They stated that it appeared to be undamaged, although oil was coming out of a vent on the after deck of the vessel. Remnants of two towlines were still in place on the vessel's forward towing bitts, and one towline on the stern was still secured to the after capstan. Visibility in the vicinity of the tug was estimated to be about 8 feet. The divers reported that the cradle for the inflatable liferaft was empty, indicating that the liferaft had deployed.

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[1] *Channel 16 is used for calling and emergency messages. Channel 13 is used for vessel bridge to vessel bridge communications.*

The Coast Guard continued to search for the liferaft, since it was conceivable that the liferaft could have been used by some of the crew to abandon the vessel. Meanwhile, diving efforts were directed to searching the vessel for bodies of other crew members. At 1115, divers from the Bridgeport marine police arrived onscene to join in the search of the vessel. At 1240, the body of the deckhand, who had been on mate's watch, was removed from the pilothouse and brought to the surface.

At 1705, the Eklof-operated tug YANKEE arrived onscene to render assistance as a floating base for diving operations and for transporting equipment and personnel to the scene. Commercial divers, hired by the owners of the CELTIC, arrived at 1810 and relieved the police divers. At 2151, the body of the cook was found in the galley and brought to the surface.

On November 20, 1984, the last two bodies, that of the captain and the able seaman on the captain's watch, were located in their respective living quarters, where they apparently had been asleep at the time of the accident. Their bodies were recovered and brought to the surface.

Later that afternoon, the commercial divers began surveying the CAPE RACE, which was resting upright and heading in a southwesterly direction. The divers reported that the tug was a few feet astern of the barge, and that the stern of the barge was adjacent to the tug's port beam. (See figure 2.) The divers stated that the tug was on a northwesterly heading and was listing about 40° to port, which prevented inspection of all of the tug's hull on the port side. Remnants of the towing lines remained secured to the forward bitts and the capstan located on the after deck. No portions of the towing lines remained attached to any of the cleats on the barge. A diver reported that there was a crater in the sea floor at the starboard bow of the barge, which he stated appeared to have been formed by the starboard bow of the barge striking the bottom.

On November 23, 1984, the liferaft, still in its container, was found on the shore near Setauket, Long Island, New York, by some persons walking along the beach. One person pulled the painter (a line which connects the liferaft to the vessel) out of the liferaft until the inflation mechanism functioned, releasing the CO_2 cylinder to inflate the liferaft. The liferaft reportedly inflated normally. One half of the float-free link was still attached to the short length of wire cable that connected to the painter. The other half was still attached to the CELTIC.

Vessel Information

CELTIC. The tug CELTIC, originally named the RUSSELL 10 and later the JUDITH MCALLISTER, was built in 1958, at Oyster Bay, New York, by Jakobson Shipyard, Inc. (See figure 3.) The tug was purchased by Island Park Tanker Corporation in January 1981 and was operated thereafter by Eklof. The tug was of all-steel construction, and it was built under the rules of the American Bureau of Shipping (ABS) and classed Maltese Cross A1 Towing Service, Coastwise Service. The vessel's principal characteristics were:

Length	85.9 feet
Beam	24 feet
Depth	11.23 feet
Gross tons	146
Horsepower	1,640

Because the CELTIC was a motor vessel of less than 300 gross tons and did not carry freight or passengers for hire,

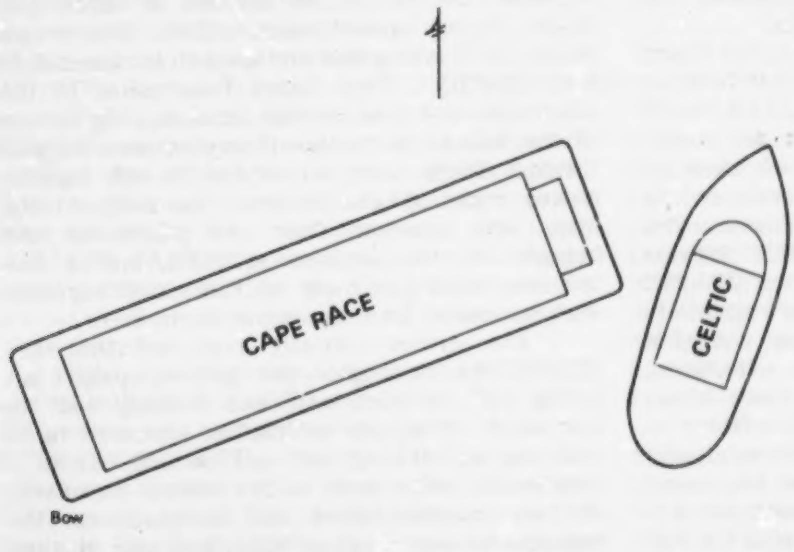

Figure 2. Approximate relative position of tug CELTIC and barge CAPE RACE on the bottom of Long Island Sound.

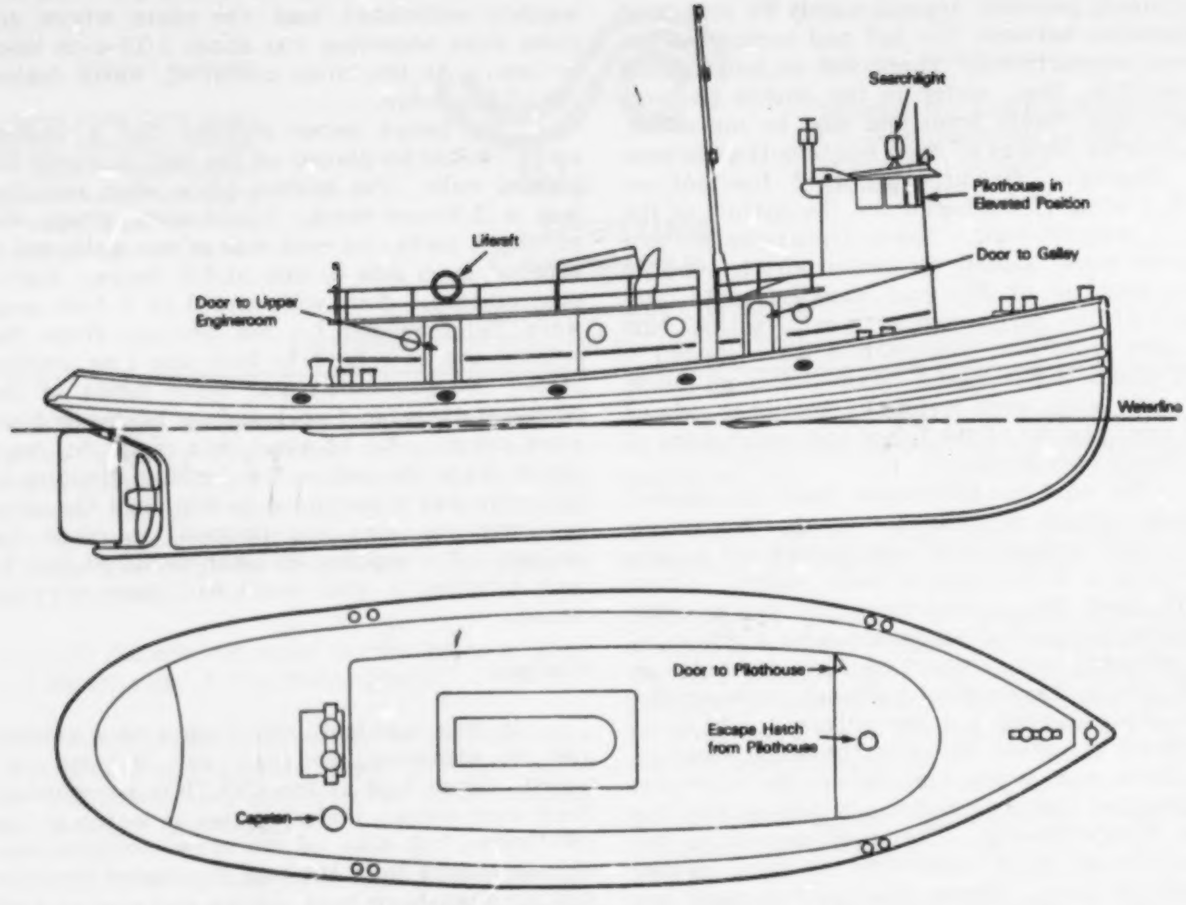

Figure 3. Plan and profile views of the tug CELTIC.

it was not subject to Coast Guard construction and inspection regulations. Since it was engaging in domestic voyages and was less than 150 gross tons, it was not subject to Coast Guard load line regulations.

CAPE RACE. The barge CAPE RACE was built in 1951 by the Bethlehem Steel Company at Mariners Harbor, New York, for the Tracy Coal Company of New York City specifically for carrying coal in the New York Harbor area. The barge was not subject to Coast Guard construction and inspection regulations, but its construction was in accordance with the ABS rules for bulk cargo barges in harbor service. The barge was designed to carry 2,050 long tons of coal at a draft of 16 feet 8 inches and to have a corresponding freeboard of 10 inches. The CAPE RACE and three other barges, the CAPE BORER, HERBERT E. SMITH, and the CAPE BARBARA, were purchased by Rudolph in 1970 for use in carrying scrap metals. The principal characteristics extracted from plans of the barge were:

Length	146 feet
Beam	38 feet
Depth	17.6 feet
Gross tons	885

The CAPE RACE was an open-hopper barge with one large cargo compartment, about 132 feet long, 31 feet wide at the main deck, and 16 feet deep. The cargo compartment (hopper) was surrounded by a coaming measuring 4.75 feet above the main deck. Both ends of the barge were raked, and there was a deckhouse on the after main deck immediately aft of the hatch coaming. The barge was of double-hull construction, so that void compartments and double bottoms surrounded the cargo compartment. The void compartments included the two rake compartments at the ends and three void compartments, which formed double bottoms and wing tanks around the cargo compartment. Each void compartment was designed to be watertight. The double bottom portion of the three void compartments provided approximately 24 inches of separation between the full and bottom of the cargo compartment. There was no longitudinal separation; thus, water in the double bottoms could flow freely from one side to the other. Transverse frames of open construction, braced by diagonal T-beams, supported the bottom shell plating of the barge and the bottom of the cargo compartment. These transverse bottom frames were spaced 24 inches apart. In the wing sections of the void compartments outboard of the cargo compartment, vertical ribs of open truss-like construction were spaced 6 feet apart. Horizontal T-beam stiffeners inside the wing areas were welded to the inner side of the shell plating of the barge and outer sides of the cargo compartment.

The void compartments could be entered through either rake compartment. Access to each rake compartment was gained via a non-watertight, 2-foot-square deck hatch. From inside each rake compartment, it was possible to enter the port or starboard wing sections of the adjacent void compartment via manholes on each side in the vertical bulkhead between the rake compartment and the adjacent void compartment. Access between the wing areas of the three void compartments was via manholes in the two vertical bulkheads separating the void compartments. The manholes were designed to be made watertight by steel covers bolted in place. These steel covers were onboard but were not used and were not in place at the time of the accident.

The CAPE RACE had a leaking problem and was drydocked from October 11 through October 22, 1984, for repairs to the barge's bottom and for painting of the bottom. Once the barge was out of the water, it was found that the leak was in a butt weld in the bottom plating amidships, a few feet in from the port side. The weld, which was described as being about 1/2-inch wide, ran across the bottom from one side of the barge to the other and joined two large bottom plates. Because the weld was found to be considerably wasted, a decision was made to build up the entire weld. The weld was to be built up by welding several courses of weld on top of the old weld. By the time the welding operation progressed a few feet from the port side, the welder discovered that the bottom plate adjacent to the weld was too thin, apparently due to wastage, to weld on and that holes were being burned in the plate. The welder attempted to weld at two other locations along the weld and discovered that the plate in those locations was also too thin to weld on. The welding foreman supervising the welding estimated that the plate where the holes were occurring was about 1/16-inch thick or less. As the holes occurred, water leaked out of the barge.

The barge owner decided that a doubler place[2] would be placed on the hull to cover the wasted weld. The doubler plate when installed was a 3/8-inch-thick, 1-foot-wide strap, extending 6 inches on each side of the weld, and it reached from side to side of the barge. Individual plates, 1 foot wide and 5 to 6 feet long, were fillet-welded to the bottom from the outside one at a time to form the long doubler plate. No inspection was made inside of the double bottom, and no gaugings of the bottom were taken. No attempt was made to drain water from the hull. The leaking diminished, but some water continued to drip until the plate covering the leak was dogged[3] in place for welding. The welding foreman testified that he was satisfied a good weld had been accomplished.

Analysis

In this accident, there were no survivors and no witnesses, nor was any distress call heard. Since four of the CELTIC's six-member crew were awake, including two on watch in the pilothouse, but none of the crew members was able to escape from the tug, it appears that the sinking must have been sudden and unexpected. An inspection of the wreckage of both vessels and a review of television recordings revealed no indication of any fire or explosion. Also, there was no visual evidence of any massive structural failure of either vessel that might have led to the accident. The CELTIC was found virtually intact resting on the bottom initially with only a 10° port list, and all crew members were found inside the vessel. The CAPE RACE had sustained considerable damage, but all significant damage appeared to have been sustained by the barge when it hit the bottom.

It may have been possible for the tug, if it

continued on page 184

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[2] *A plate of steel placed over a hole and fillet-welded to good metal beyond the hole.*

[3] *Temporary clamps welded to the hull for holding a place in place. Metal wedges are driven between the clamps and plate to force the plate against the hull.*

Member Agencies:

United States Coast Guard
Naval Sea Systems Command
Maritime Administration
American Bureau of Shipping
Military Sealift Command
Minerals Management Service

Ship Structure Committee

Address Correspondence to:

Secretary, Ship Structure Committee
U.S. Coast Guard Headquarters, (G-M/TP 13)
Washington, D.C. 20593
(202) 426-2197

An Interagency Advisory Committee
Dedicated to the Improvement of Marine Structures

April 1986

The Ship Structure Committee, an interagency advisory committee dedicated to the improvement of marine structures, has recently published ten new technical reports of interest to those concerned with the design and safety of ships and offshore structures. The reports are as follows:

SSC-317, Determination of Strain Rates in Ship Hull Structures: A Feasibility Study

This report presents a survey of existing data on shipboard stress/strain rates. The data bases are evaluated, and strain rates from existing ship data are developed.

SSC-319, Development of a Plan To Obtain In-Service Still Water Bending Moment Information for Statistical Characterization

This report reviews previous instrumentation programs and recommends means to gather still water bending moment (SWBM) data in sufficient quantity to be useful for statistical characterization and to obtain SWBM envelope curves.

SSC-321, Survey of Experience Using Reinforced Concrete in Floating Marine Structures

This report reviews applications of marine concrete structures, research into concrete structures, and inspection and repair of these structures and presents an extended bibliography on the subject.

SSC-322, Analysis and Assessment of Major Uncertainties Associated with Ship Hull Ultimate Failure

This report considers the uncertainties of the primary hull longitudinal compression failure mode and uses coefficients of variation to obtain safety indices used in this reliability design approach.

SSC-323, Updating Fillet Weld Strength Parameters for Commercial Shipbuilding

This report presents a possible alternative method of assessing fillet weld requirements to the ABS weld tables. The recommended methodology is demonstrated on previous designs pointing to a cost savings of from 9 to 15 percent of welding costs.

SSC-324, Analytical Techniques for Predicting Grounded Ship Response

This report investigates the use of portable computers during salvage scenarios after a ship grounding and demonstrates how they could be used by the salvage master.

SSC-325, Correlation of Theoretical and Measured Hydrodynamic Pressures for the SL-7 Containership and the Great Lakes Bulk Carrier S.J. CORT

This report shows the amount of correlation between theoretical calculations, model testing results, and full-scale data collection of hydrodynamic pressures on the SL-7 class of containership and the M/V STEWART J. CORT.

SSC-326, Long Term Corrosion Fatigue of Welded Marine Steels

This report represents a first look at corrosion fatigue by the Ship Structure Committee. It assesses those future directions that would be most fruitful for further study, approaching fatigue from both the deterministic and the probabilistic viewpoints.

SSC-327, Investigation of Steels for Improved Weldability in Ship Construction

This report is directed toward determining the weld procedure and metallurgical control necessary to develop adequate toughness in the weldment, using high-deposition rate weld procedures. This report is the third and final phase of the welding effort and follows SSC-298 and SSC-305.

SSC-328, Fracture Control for Fixed Offshore Structures

This report gives a state-of-the-art summary of material selection design, construction, and operation of fixed offshore platforms and explains how detrimental fractures are prevented. This report will serve as a basis for beginning a fracture control program.

A limited number of reports will be available free of charge. After that, copies will be available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. For copies of the reports or further information, contact LCDR Thomas H. Gilmour, Secretary, Ship Structure Committee, U.S. Coast Guard (G-MTH-5), 2100 Second Street, SW, Washington, DC 20593. ‡

CELTIC and CAPE RACE

continued from page 182

sank first, to have heeled the barge and reduced the barge's after freeboard enough so that water could have flooded into the cargo compartment through holes in the coaming near the deck. However, the evidence suggests that the accident was not caused by the tug. There was nothing to indicate that the tug sustained any catastrophic hull failure that could cause it to lose buoyancy rapidly. Any serious flooding of the vessel probably would have become apparent to those crew members who were awake. Also, the engineroom, the largest floodable space, was fitted with a bilge alarm. The chief engineer was among the four crew members who were awake at the time of the accident, and he probably would have become aware of any serious flooding in the engineroom. Any substantial flooding of the tug probably would have produced a noticeable list or change in trim well before all positive buoyancy was lost. Also, a sinking tug connected to the after port side of the CAPE RACE probably would not have resulted in rapid sinking of the barge. Further, it is probable that if the tug sank first, it would have caused the barge to sink by the stern and sustain substantial damage aft; however, there was no damage on the stern of the CAPE RACE.

The most probable explanation of the sinking is that the CAPE RACE, which was loaded to a safe freeboard, sustained a full failure resulting in an opening in the underwater hull. The barge probably took sufficient water forward to plunge the bow underwater, resulting in critical downflooding into the cargo compartment through holes in the coaming, and to sink bow first; as the barge sank, it pulled the tug underwater with it. The impact damage to the CAPE RACE was concentrated on the bow and in the forward half of the barge, indicating that the forward end of the barge sustained the force of the impact with the bottom. The cargo of scrap iron had shifted forward, some pieces spilling over the forward coaming and some pieces spilling over the bow onto the bottom, indicating that the bow of the barge was angled sharply downward at the time it struck the bottom. A crater in the bottom observed at the starboard bow by one of the divers indicates that the starboard bow struck first. The damage on the starboard side was significantly greater than on the port side, which tends to confirm that the starboard bow absorbed most of the impact. As the barge sank, the starboard bow probably was depressed more than the port bow as a result of the buoyancy of the tug fastened at the after port side of the barge.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of the tug CELTIC and barge CAPE RACE was the failure of the owner of the barge to maintain the barge adequately, which allowed the internal structure and shell plating of the barge to deteriorate until the barge sustained a hull failure, resulting in the flooding of the forward part of the barge, causing the barge to plunge underwater bow first and sink. The tug was pulled underwater by the sinking barge. Contributing to the sinking of the tug was the lack of a means to release the towing lines to the barge quickly and remotely from the pilothouse. ‡

Marine Safety Manual, Volume I, Now Available

The **Marine Safety Manual (MSM)** is a 10-volume publication which provides information and guidance to Coast Guard personnel assigned to marine safety duties. First published in 1978, the **MSM** is being revised to update the subject matter and to comply with the Coast Guard Directives System. Volumes previously published were Volume IV, **Technical,** December 1984; Volume II, **Materiel Inspection,** October 1985, and Volume III, **Marine Industry Personnel,** December 1985.

Seven of the volumes will be available to the general public when revision has been finalized (two volumes are being developed, and one is classified).

Volume No.	Title	COMDINST No.
I	Administration and Management	M16000.6
II	Materiel Inspection	M16000.7
III	Marine Industry Personnel	M16000.8
IV	Technical	M16000.9
V	Investigations	M16000.10
VI	Ports and Waterways Activities	M16000.11
X	General (MOUs, ACRONYMS)	M16000.15

The fourth of the revised **MSM** volumes, Volume I, **Administration and Management,** is now available from the U.S. Government Printing Office (GPO). For your convenience, we are including a GPO order form for this publication.

Volume I presents the authority, background, and rationale for the various programs associated with marine safety duties, along with a detailed overview of specific legal authorities, enforcement policies, management standards, professional training, and administrative and information systems which relate to these program areas.

Similar notifications will be provided in this magazine when the remaining **MSM** volumes are published.

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Pilot Ladder Safety, Fourth Edition

This book, as the title implies, has been written for the practical purpose of providing pilots, masters, ships' officers, and all those who are involved in pilotage generally with a concise account of international requirements for boerding and disembarking by pilot ladder.

In a modern, highly organized maritime world, the professional mariner is expected to have knowledge of national and international regulations, despite their growing complexity, whenever the mariner comes into contact with them. These considerable obligations weigh particularly upon the master and ships' officers who incur special responsibilities toward the pilot for the safe boarding and disembarkation by pilot ladder.

Pilot ladder regulations in all countries are based on Safety of Life at Sea (SOLAS) Chapter V Regulation 17, which was drawn up by the International Maritime Organization (IMO) in 1973. In addition to a detailed explantion of this regulation, the book also includes other IMO recommendations and several recommendations proposed by the International Maritime Pilots' Association (IMPA).

The author of this book, Captain Malcolm Armstrong, combines his professional experience (as a professional pilot in Australia and as a former Vice-President of the International Maritime Pilots' Association) and his knowledge of international technical pilotage matters for the benefit of the pilot who needs information or wants to refresh his memory from an authoritative source.

Proceedings readers should note that the article entitled "Pilot Ladder Safety" in the July 1982 issue of the magazine (page 201) was based on an earlier edition of Captain Armstrong's book.

Pilot Ladder Safety is available for £6.00 from Brown, Son & Ferguson, Ltd., 4-10 Darnley Street, Glasgow G41 2SD Scotland.

This Is Boat Handling at Close Quarters

In the tradition of the highly regarded "This Is..." series on sailing, this new title details how to operate a boat in tight situations. These situations are commonly found in the areas where most boaters spend much of their time: marinas, around moorings and dock areas, in harbors, and on rivers and canals. The authors have deftly analyzed an array of boat handling problems, and here they offer step-by-step advice on how to handle a boat, power or sail, in all types of conditions and circumstances.

Utilizing the lavish graphics that are the trademark of the "This Is..." series, *This Is Boat Handling at Close Quarters* depicts the best methods of maneuvering to avoid collisions. It is a complete guide to building seamanship skills and confidence.

The authors, Dick Everitt and Rodger Witt, are yachting journalists who have written on the subject for many years. They are currently staff members of the magazine **Practical Boat Owner** and live in England.

This Is Boat Handling at Close Quarters is available for $17.95 from William Morrow & Co. (Hearst Marine Books), 105 Madison Avenue, New York, New York 10016.

This Is Fast Cruising

This is a book for those who want to further their sailing enjoyment and experience. "Fast cruising" is a phrase used by the author, Peter Johnson, to describe the philosophy and practice of sailing with everything just right. For instance, the owner or skipper and crew is shown how skilled navigation can result in quicker passages, how cetain kinds of deck gear can make sail handling a pleasure, and how accommodations designed for passage making can enhance night sailing.

Though much of the selection and updating to improve performance and style applies to a modern production cruiser, variations are not ignored, and there is discussion on multihulls, special rigs and sails, and the relevance of different designs and construction.

Among the topics, all illustrated with full-color photographs and full-color diagrams, are modern techniques for heavy weather and advisable preparations for it. Single-handed sailing receives close attention as do modern electronic aids, which are surveyed in a practical manner, an approach which is maintained on the many detailed subjects in this book.

continued on page 188

Scott Rogerson

Formic Acid

If you've ever been stung by a stinging ant or caterpillar, or if you've come in contact with stinging nettles, then you know about this month's chemical. Formic acid is the irritating component in the poison which is so generously given to you by each of the above in their natural acts of defense. The name itself comes from the fact that the acid was first prepared by the distillation of red ants (Formica Rufa).

Formic acid, $HCOOH$, is used in a number of processes, including dehairing hides for leather, manufacturing fabric dyes, and coagulating rubber latex. It is prepared commercially from carbon monoxide and sodium hydroxide at elevated temperature and pressure in the following reaction:

$$\mathrm{CO + NaOH \rightarrow HC\ HCOONa}$$

The sodium formate is then converted to the free acid by the addition of sulfuric acid. Formic acid is manufactured by several well-known companies, including Middleboro Industries and Union Carbide Corporation.

Formic acid is the simplest of the carboxylic acids, yet it is not typical of others in its group. It is distinguished by its acid strength, its failure to form an anhydride, and its reactivity as a reducing agent, a property due to the $-CH{=}O$ group, which imparts some of the character of an aldehyde.

The chemical decomposes to water and carbon dioxide catalytically or upon heating, and concentrated sulfuric acid dehydrates it to water and carbon monoxide. Pure formic acid is a colorless, fuming liquid with a pungent odor. It is irritating to the mucous membranes and vesicant (causes blistering).

The first step in dealing with an accidental discharge of formic acid is to shut off or eliminate all possible ignition sources. The next step is to stop the discharge. Anyone working in the area should be wearing a chemical protective suit (including gloves and goggles) and should be using a self-contained breathing apparatus. The fire department should be called immediately and every attempt should be made to isolate and remove the discharged material. Local health and pollution control agencies should be notified, and in the case of a spill in natural waters, wildlife officials and operators of nearby water intakes should also be notified. Formic acid in high concentrations can be dangerous to aquatic life and can be extremely dangerous if it enters water intakes.

In case of exposure to the acid, a doctor should be notified. The liquid will burn the skin and eyes. All contaminated clothing and shoes should be removed. and the affected areas should be flushed with plenty of water. If any acid gets in the eyes, the eyelids should be held open and flushed with plenty of water.

If formic acid is swallowed, **do not induce vomiting.** If the victim is conscious he/she should drink water or milk. If the victim is unconscious, then do nothing except to keep the victim warm. Wait for professional assistance for treatment beyond this step.

Fires involving formic acid should be extinguished with water, dry chemicals, alcohol foam, or carbon dioxide. Exposed containers should be cooled with water to prevent further danger.

Formic acid is shipped as a colorless liquid. It is transported by various means: railroad tank cars, tanker trucks, or in tankships. Type 316, stainless steel or lead-lined tanks are satisfactory containers for the acid. It is very stable but does react with bases to produce heat. Although the U.S. Environmental Protection Agency does not regulate formic acid as a pollutant, the U.S. Department of Transportation regulates formic acid as a corrosive. The U.S. Coast Guard requires that formic acid be separated from other corrosive materials by one of the following: cofferdam, empty tank, void space, cargo handling space, a tank containing a compatible cargo, or piping tunnel.

Scott Rogerson was a Fourth-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

Chemical name:	Formic Acid
Formula:	HCOOH
Synonyms:	methanoic acid formylic acid
Physical Properties:	
boiling point:	101°C (214°F)
freezing point:	8.4°C (47.1°F)
vapor pressure: 20°C (68°F)	23-33 mmHg
Threshold Limit Values (TLV)	
time-weighted average:	5 ppm; 17.5 mg/m^3
Flammability Limits in Air	
lower flammability limit:	18% by vol.
upper flammability limit:	57% by vol.
Combustion Properties	
flash point (cc):	69°C (156°F)
autoignition temperature:	601°C (1114°F)
Densities	
vapor (air=1):	1.6
U.N. Number:	1779
CHRIS Code:	FMA
Cargo compatibility group:	4 (Organic Acids)

NEW PUBLICATIONS

continued from page 186

This Is Fast Cruising is available for $18.95 from William Morrow & Co. (Hearst Marine Books), 105 Madison Avenue, New York, New York 10016.

General Engineering Knowledge

The second edition of a handy book entitled *General Engineering Knowledge* has been published by Sheridan House, Inc., 145 Palisade Street, Dobbs Ferry, NY 10522. The book's author, David McGeorge, lectures at the College of Maritime Studies, Southampton, England.

The publication is intended for marine engineers who are studying for certificates based on the British system, but it could be useful for anyone studying for similar examinations. The book covers pumps, coolers, fire protection, refrigeration, steering gear, stern bearings, fuel, and pollution.

A large number of simple drawings are used to illustrate descriptions in the book, and it contains a great deal of information packed into a small space.

Copies may be ordered from the publisher at $10.95.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. A high percentage of carbon dioxide in boiler flue gases indicates

A. no carbon dioxide present.
B. too much excess air.
C. contaminated fuel oil.
D. nearly complete combustion.

Reference: Babcock & Wilcox, Steam: Its Generation and Use

2. A turbocharged, four-stroke cycle engine has a larger valve overlap than a naturally aspirated four-stroke cycle engine to increase the

A. temperature of the exhaust gases.
B. energy supplied to the turbocharger.
C. air pressure to the intake manifold.
D. cooling effect on the exhaust valves.

Reference: Henshall, Medium and High Speed Diesel Engines for Marine Use

3. The most common type of A.C. service generator found aboard ship is the stationary

A. electromagnetic field revolving armature-type.
B. electromagnetic field oscillatory armature-type.
C. armature-oscillatory electromagnetic field-type.
D. armature rotating elec-

tromagnetic field-type.

Reference: Basic Electricity, NAVPERS 10086-A

4. Where are moisture shields located?

A. Around the throttle valve stems
B. At the steam strainer inlet
C. At the inner stage diaphragms
D. On the last stages of the rotor blading

Reference: Harrington, Marine Engineering; Osbourne, Modern Marine Engineer's Manual, Vol. I

5. Which refrigerant will break down and produce phosgene gas when subjected to high heat?

A. CO_2
B. Methyl chloride
C. R-22
D. Sulphur dioxide

Reference: Marsh, Olivo, Principles of Refrigeration, 2nd ed.

DECK

1. For the purpose of cargo oil containment, the fixed container under the manifold of an 8-inch loading line must hold a minimum of

A. 3 barrels.
B. 4 barrels.
C. 6 barrels.
D. 8 barrels.

Reference: 33 CFR 155.310 (1)(IV)

2. Loran C ground waves provide position information of reasonable accuracy out to a range of

A. 300 miles.
B. 1200 miles.
C. 1800 miles.
D. 2400 miles.

Reference: Bowditch, American Practical Navigator

3. Your draft in fresh water is 17'9". What will be your draft at sea?

A. 17'0"
B. 17'4"
C. 18'1"
D. 18'8"

Reference: Ladage, Stability and Trim for the Ship's Officer

4. The wind is NE, and a sailing vessel is steering NW. What tack is the vessel on, and what fog signal should it sound?

A. Port tack — one blast at 1-minute intervals.
B. Starboard tack — one blast at 1-minute intervals.
C. Starboard tack — two blasts at 1-minute intervals.
D. Starboard tack — one prolonged and two short blasts at 2-minute intervals.

Reference: "Navigation Rules, International-Inland," COMDTINST M16672.2A

5. Which of the following flash points would indicate a grade D combustible liquid?

A. 40°F
B. 95°F
C. 79°F
D. 155°F

Reference: 46 CFR 30.10-15(a)

ANSWERS

ENGINEER
1-D;2-D;3-D;4-D;5-C
DECK
1-A;2-B;3-B;4-D;5-B

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

More Gallant Ships

In May 1985, Gallant Ship plaques were presented by the Maritime Administration to the owners and crews of three vessels whose heroic response saved many lives during the sinking of the tanker AMERICAN EAGLE in the Gulf of Mexico on February 26, 1984.

F. X. McNerney, the Maritime Administration's Central Region Director, acting on behalf of Secretary of Transportation Elizabeth Hanford Dole and Maritime Administrator John Gaughan, presented Gallant Ship plaques to Offshore Logistics, Inc., at Lafayette, Louisiana, as owners of the M/V ENTERPRISE and M/V STARLIGHT, and to White Cap Marine at Morgan City, Louisiana, as owner of the M/V LIBERATOR.

Individual awards to crew members of the vessels were also presented at Lafayette and Morgan City, as were awards to the anchor handling crew of the M/V ENTERPRISE at Del Mar Offshore in New Iberia, Louisiana.

Coast Guard Papers Will Be Presented to the National Safety Congress

Several Coast Guard officials will be presenting papers to the National Safety Congress, to be held in Chicago, Illinois, October 19-20, 1986. A list of authors, as well as synopses of their papers, is given below. Interested readers may wish to contact the authors for copies.

Marine Vapor Control/Recovery Safety Concerns
Mr. Frits Wybenga, Hazardous Materials Branch
(202) 426-1217

State Implementation Plans (SIPs) for achieving federally required ambient air quality standards for volatile organic compounds may include standards restricting tank vessel hydrocarbon emissions during loading, ballasting, and tank cleaning. These restrictions may necessitate the use of vapor control/recovery equipment by marine vessels during these operations. The use of this equipment and the possibility of non-uniform state emission standards can pose significant safety hazards to these vessels and potentially hinder interstate commerce. The Coast Guard is particularly concerned about the possibility of any derogation of safety. Industry has expressed its concern on these subjects and encouraged federal preemption of control over marine vessels through legislation or direct Coast Guard intervention. The paper will discuss present state initiatives, Coast Guard policy, Department of Transportation (DOT) activities, and a recent study undertaken by the Marine Board of the National Academy of Sciences on vapor control/recovery systems.

Merchant Marine Occupational Health Studies
Mr. Michael Morrissette, Hazardous Materials Branch
(202) 426-1577

In the late 1970s, the Coast Guard began a series of research studies to investigate the potential health problems related to various work activities on board chemical and petroleum tank vessels. An estimated 21,000 merchant marine personnel are engaged in petrochemical/chemical cargo operations. The research studies have generated extensive occupational exposure data which show that chemical vapor concentrations are frequently above permissible limits during such operations as tank gauging and tank entry. The long-term health implications are potentially serious — many products are known to have detrimental health effects including a significant number which are known or suspected human carcinogens. The Coast Guard's overall goal is to minimize occupational health risks using a combination of engineering, administrative, training, and personal protective measures.

Our contractor for the research studies has recently completed a 6-month trial implementation of a model health and safety program at Coast Guard units in Houston and Galveston, Texas. A second program is being implemented with a marine company. It is scheduled to begin this fall. The final product of the study will be a generic but comprehensive health and safety plan that each company can structure to its own needs. The plan will be available in 1987 and will be distributed to the marine industry.

Certification and Drydocking of Tank Barges
LCDR Francis Barnett, Eighth District Marine Inspection Office, New Orleans
(504) 589-6183

This paper discusses the certification and drydocking of tank barges with the emphasis on dangerous cargo barges. Nowhere in the Coast Guard's arsenal of manuals and instructions is there a readily understandable, definitive treatment of this sometimes complex topic. This paper uses the Certificate of Inspection as its focus, addressing all the various entries and endorsements that the Coast Guard employs. Primary attention is paid to operational areas, such as (a) how and why loading constraints are developed, (b) how cargo tank inspection and drydocking intervals are established and sometimes extended, and (c) the addition of dangerous cargoes to a barge's certificate. Also, advice on properly preparing a tank barge for Coast Guard inspection is included.

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International and Domestic Port Facility Security
CDR Thomas Robinson, Port and Environmental Safety Division
(202) 426-1934

The September 1985 hijacking of the cruise ship ACHILLE LAURO and the subsequent murder of one of its passengers resulted in increased awareness of the vulnerability of our port facilities, and the ships that use them, to terrorist acts. More than half of the world's cruise passengers are U.S. citizens, and nearly all cruise ships embarking passengers in U.S. ports are registered in foreign countries, making this truly an international problem. The Coast Guard has been intimately involved, through the International Maritime Organization (IMO), in developing security measures for the protection of passengers and crews from unlawful acts. A domestic port security program focusing on prevention of terrorism is being formulated by the Administration and the Congress. Improved security systems and procedures, based on the internationally agreed measures, will be implemented at U.S. port terminals, as appropriate. Recent world events have shown that increased cooperation and exchange of information among like-minded nations is necessary to enhance the safety and security of passengers and crews embarking on ships. A description of the international proposals is provided as well as the potential input on U.S. interests.

Keynotes

Notice

CGD 86-019 Alternative Compliance, Inland and International Navigation Rules (June 9)

Rule 38 of both the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS) and the Inland Navigation Rules exempts vessels which were built before the rules became effective from certain technical provisions concerning the position of lights. Certain temporary exemptions terminate 9 years after the effective date. The 9-year exemption periods expire July 15, 1986 on COLREGS waters, December 24, 1990 on Inland waters, and March 1, 1992 on the Great Lakes. Vessels which have been operating under the temporary exemption of Rule 38 are expected to be in full compliance by these dates; however, vessels of special constuction or special purpose, especially those 20 to 50 meters in length with the pilothouse located forward of a single mast and the sidelights forward of the masthead light, may be entitled to Alternative Compliance Certificates, which will allow them to continue to operate with their existing lights.

Notice of Proposed Rulemaking

CGD 86-037 Documentation of Forfeited Vessels (June 13)

The Coast Guard is proposing to revise the regulations concerning the documentation of vessels forfeited for a breach of the laws of the United States. The revised regulations would recognize administrative forfeiture proceedings and the effect of forfeiture on liens and encumbrances of record. Recent statutory changes affecting the maximum value of vessels subject to administrative forfeiture proceedings has resulted in an increase in the number of vessels eligible for documentation being forfeited in this manner. Existing regulations only recognize judicial forfeiture and do not take into account that a forfeiture results in the vessel being cleared of existing liens and encumbrances. These changes will improve the marketability of vessels forfeited and allow vessel purchasers to realize the full benefits of a vessel with a clear title and domestic trade entitlements. The deadline for comments on this notice was July 14, 1986.

CGD 85-059 Ventilation Standards (June 23)

This notice proposes amendments to the Ventilation Regulations in Subpart K of Part 183 of Title 33, Code of Federal Regulations. The Coast Guard undertook a review of its regulations governing construction standards which apply to the manufacture of recreational boats in an effort to reduce the burden of existing regulation while ensuring that boats are built to an adequate level of safety. Based upn the review effort, it has been determined that two of the requirements for natural ventilation do not contribute to boating safety. Therefore, these proposed amendments would relieve existing regulatory burdens upon recreational boat manufacturers. Comments must be received on or before August 22, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

U.S. Department
of Transportation

United States
Coast Guard

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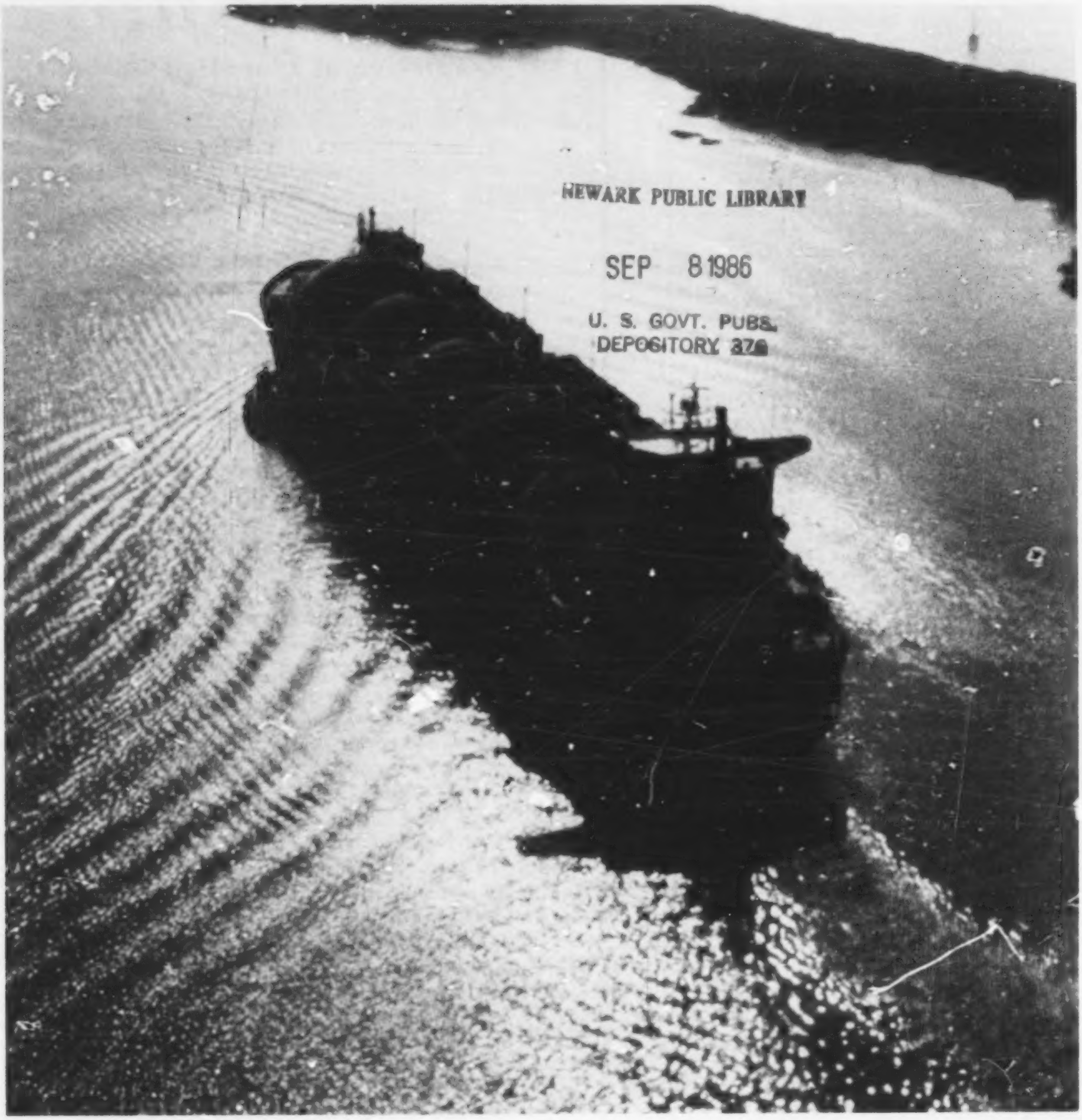
of the Marine Safety Council

Vol. 43, No. 9



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September 1986

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of the Marine Safety Council

Vol. 43, No. 9

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Our cover photo of a liquefied gas carrier was supplied by the Coast Guard's Office of Boating, Public and Consumer Affairs.

Regulation of Liquefied Gas Ships in the United States

LT Kevin S. Cook

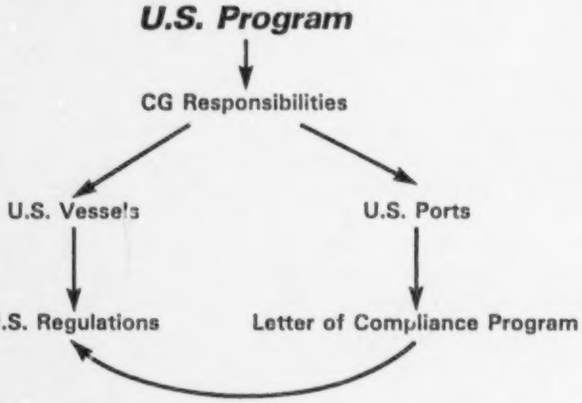
The production, use, and transport of liquefied gases in the United States has increased dramatically during the past two decades. To accommodate this expanding trade, there has been a marked increase in the number of ships dedicated to the carriage of liquefied gases. Today there are over 100 gas ships certificated for trading in the United States.

Throughout this period of growth, the U.S. regulatory program for the carriage of liquefied gases in bulk has ensured the safety of U.S.- and foreign-flag ships in U.S. ports. Maintaining the effectiveness of this regulatory program is a dynamic process. The Coast Guard actively participates in the International Maritime Organization (IMO) and continues to update U.S. regulations to reflect internationally agreed upon standards. Additionally, through concept review of novel liquefied gas containment systems, the Coast Guard maintains an awareness of the technological developments in the liquefied gas shipping industry.

U.S. Regulations

The U.S. program for regulating the carriage of liquefied gases is founded in two separate yet related Coast Guard responsibilities. These are outlined in figure 1. First is the Coast Guard's responsibility for ensuring the safety of U.S. vessels. This is accomplished by the development and enforcement of standards for the design, construction, repair, maintenance, and operation of U.S.-flag merchant ships, including liquefied gas ships.

Figure 1



The second responsibility is for the safety of U.S. ports. Most of the liquefied gas imported and exported is carried on board foreign-flag vessels. While the inherent dangers of liquefied gas carriage and handling could be addessed adequately on U.S. vessels by procedures in place, a program was necessary to ensure an adequate level of safety on foreign-flag vessels. This need was recognized in the early 1960s and precipitated development of the Letter of Compliance (LOC) program for the regulation of all foreign-flag vessels carrying dangerous bulk cargoes, including liquefied gases, in U.S. waters.

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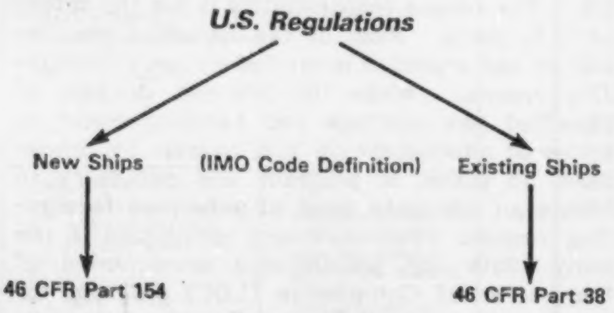
With the LOC program, all foreign-flag gas ships in service to the United States were required to meet nearly the same high standards as were required for U.S.-flag ships. Ensuring compliance with these unilateral standards was a tremendous task. Soon the Coast Guard recognized that the issue of standards for gas ship safety was an international problem requiring an international solution.

The Coast Guard put forth a U.S. initiative at IMO to raise international standards for all gas ships to the level already required for U.S. service. This effort was very successful, culminating in the adoption in 1975 of the IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IMO Gas Carrier Code). Under the code, a gas ship's flag administration is responsible for ensuring compliance with the applicable standards. Thus, the Coast Guard was able to relieve itself from much of the work associated with enforcing unilateral standards without diminishing the level of safety provided to U.S. ports.

Both the IMO Gas Carrier Code and U.S. regulations contain definitions for "new" and "existing" gas ships. Generally, those vessels with a building contract signed after October 31, 1976 are considered "new" ships. New ships are constructed to the high standards recommended by the IMO Gas Carrier Code. Those vessels contracted before October 31, 1976 are considered "existing" ships and are constructed to a variety of standards.

As shown in figure 2, the regulatory standards applicable to new ships trading in the United States are located in Title 46, Code of Federal Regulations (CFR) Part 154. U.S. regulatory standards applicable to existing ships can also be found in Title 46; however, they are located in Part 38.

Figure 2



New Ships

The Coast Guard implementation of the recommendations of the IMO Gas Carrier Code into U.S. regulations occurred in 1979. These regulations contain the standards applicable to new ships, Part 154, "Safety Standards for Self-Propelled Vessels Carrying Bulk Liquefied Gases." Part 154 closely parallels the recommendations of the IMO Gas Carrier Code both in organization and content, with the notable exception of four areas where the Coast Guard requires standards differing from the minimum recommendations of the IMO Gas Carrier Code. These standards include the following:

(1) Use of enhanced grades of hull steel for crack-arresting purposes.

(2) Higher design stress factors for certain independent tanks.

(3) Lower design ambient air and seawater temperatures.

(4) Prohibition of tank venting as a means of cargo tank pressure/temperature control.

When a current project to incorporate amendments to the IMO Gas Carrier Code into Part 154 is completed, U.S. regulations will be up to date with the complete IMO Gas Carrier Code. The regulations also will be current with the International Gas Carrier Code since it is nearly identical to the IMO Gas Carrier Code. The International Gas Carrier Code, adopted in 1983 as an amendment to the International Convention for the Safety of Life at Sea (SOLAS), became effective in July 1986.

Part 154 also prescibes how a foreign-flag owner may place his vessel into U.S. service. (This information is discussed in the Letter of Compliance section of this article.)

Existing Ships

Initially and for many years, Coast Guard acceptance of all existing gas ships was based only on a detailed review of vessel design plans ("plan review") intended to ensure compliance with the standards in Part 38. Although some member nations of IMO insisted on developing a code applicable to existing gas ships, many of the recommendations of the Existing Gas Ship Code were not supported by the United States and were not implemented into U.S. regulations. This was primarily because this code was silent on or recommended standards below the

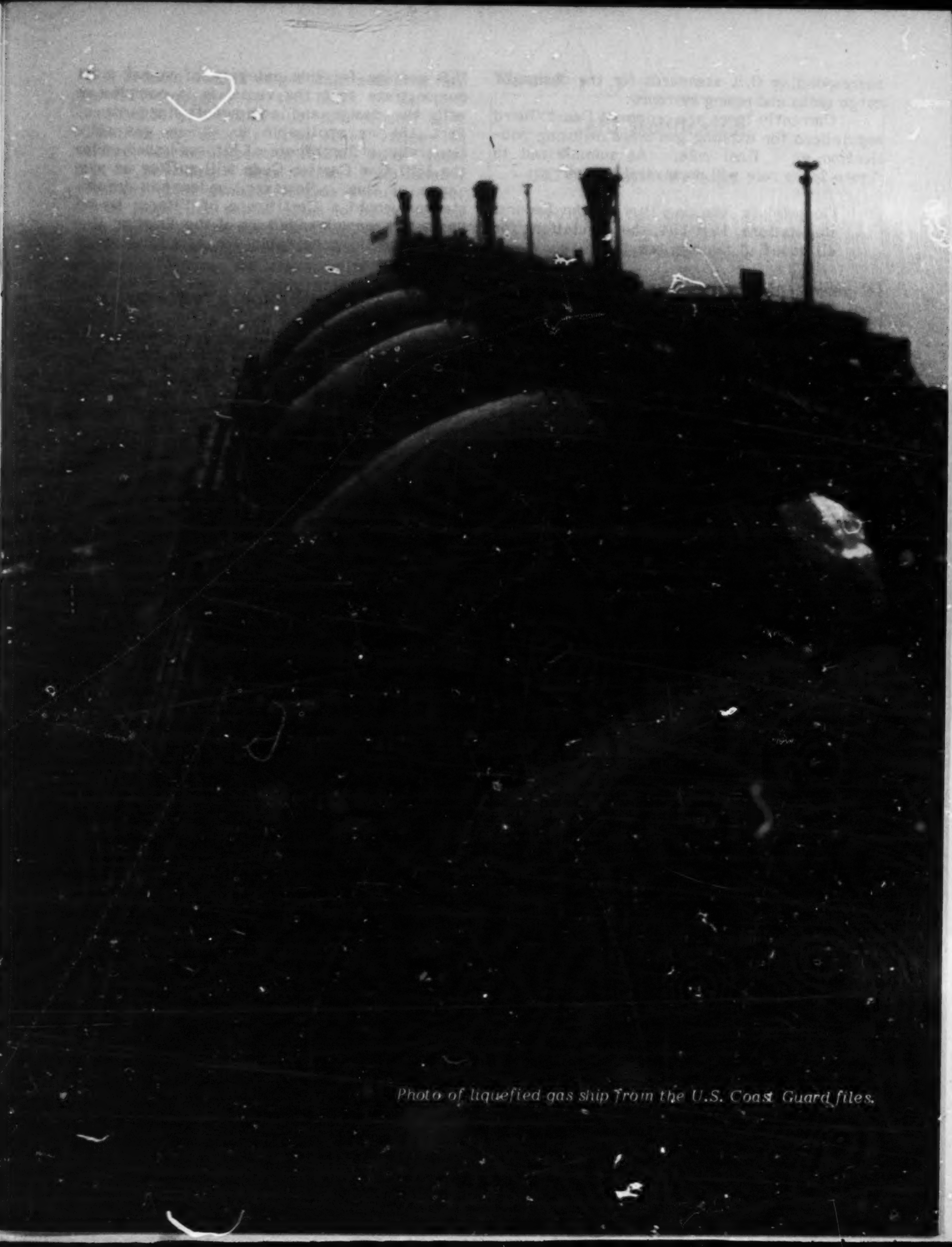


Photo of liquefied gas ship from the U.S. Coast Guard files.

corresponding U.S. standards for the design of cargo tanks and piping systems.

Currently there are proposed Coast Guard regulations for existing gas ships awaiting publication as a final rule. As summarized in figure 3, the rule will do several things:

(1) Consolidate into one Part of the Federal Regulations, Part 154, the regulations for all liquefied gas carriers.

(2) Eliminate the need for Coast Guard plan review of existing foreign-flag vessels in most cases.

(3) Upgrade U.S. regulations for all existing gas ships by generally incorporating those standards contained in the IMO Code for Existing Gas Ships which introduce a higher level of safety than presently found in Part 38.

The impact of the new rule is minimal for U.S.-flag existing gas ships and foreign-flag existing gas ships now in the Letter of Compliance program or having previously completed Coast Guard plan review. Once the rule becomes effective, compliance with the changes will be expected when a vessel's recertification is due. Existing foreign-flag gas ships must possess an IMO Certificate of Fitness suitably endorsed to indicate compliance with the recommended upgrades of the Existing Gas Ship Code.

For those foreign-flag existing gas ships not presently in the Letter of Compliance program and not having completed Coast Guard plan review, the impact is severe. Once the final rule becomes effective, applications for U.S. service for this category of vessel must demonstrate that the vessel is in compliance with the design and equipment standards of Part 154 as applicable to a new gas ship. Generally, a Certificate of Fitness issued under the IMO Gas Carrier Code will suffice as evidence of this. However, under no circumstances would a Certificate of Fitness issued under the recommendations of the Existing Gas Ship Code be acceptable for certification of these vessels.

Figure 3

Proposed Rulemaking for Existing Gas Ships

- Place Regulation of All Gas Carriers Into Part 154
- Significantly Reduce CG Plan Review
- Upgrade U.S. Regulations

Letter of Compliance Program

All foreign-flag ships loading, discharging, or carrying bulk hazardous liquid in the United States are required to obtain a Letter of Compliance (LOC) from the Coast Guard. Issuance of an LOC is evidence that a particular vessel meets or exceeds the standards contained in U.S. regulations and, through biennial examinations, that the vessel is maintained and operated safely.

The LOC program emerged from concern for the risk posed to U.S. ports by foreign-flag ships carrying hazardous cargoes, including liquefied gases. Since instituted in the early 1960s, the program has undergone a number of changes. The most significant change was the implementation of the IMO Gas Carrier Code into U.S. regulations in 1979. This is the change which allowed IMO Certificates of Fitness issued by the flag administration under the IMO Gas Carrier Code to be accepted as evidence the ship meets the recommended standards contained in the code. It replaced the need to conduct Coast Guard plan review in many cases, resulting in a substantial resource savings without a reduction in the level of safety.

More recently, in April 1985, several administrative changes to the LOC program became effective. Owners, operators, and U.S. agents of foreign-flag vessels should take special notice of these changes to facilitate certification of their vessels for U.S. service.

First, recent U.S. laws mandated a name change from "Letter of Compliance" to "Certificate of Compliance"; however, the new form will not be available until later this year. To avoid confusion until the new Certificate of Compliance form is available, the LOC will continue to be used. Additionally, vessels in possession of a valid LOC will not have to obtain a Certificate of Compliance until the LOC expires. The name change will not affect the manner in which a liquefied gas ship is certificated.

Second, owners of gas ships accepted into the LOC program on the basis of an IMO Certificate of Fitness must now request LOC examinations directly from the Officer in Charge, Marine Inspection (OCMI) at the local port by providing 7 days notice. Additionally, the April 1985 changes include a requirement for an inspection set of plans to be on board. This eliminates the need for Coast Guard Headquarters to forward plans and has allowed the period of notice for an examination to be reduced to 7 days. These recent changes did not affect the required 14 days' notice to Headquarters for those existing ships in the LOC program on the basis of Coast Guard plan review.

For the owner of a new liquefied gas ship making an application to the LOC program, the procedure is quite simple, as demonstrated in figure 4. Application is made to Coast Guard Headquarters and should contain the following:

(1) Certificate of Fitness (issued under the IMO Gas Carrier Code or International Gas Carrier Code).

(2) Verification of compliance with the applicable special areas.

(3) A description of the vessel.

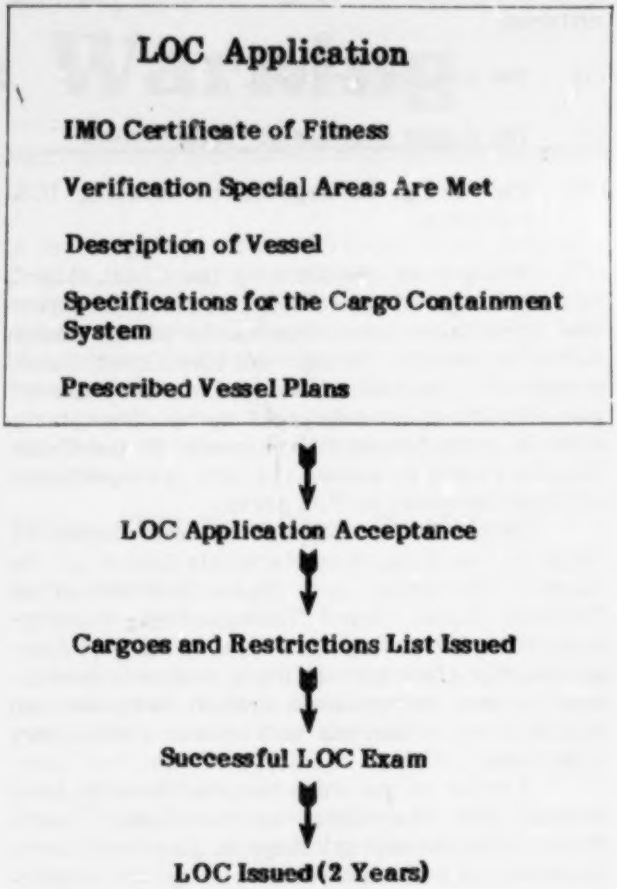
(4) Specifications for the cargo containment system.

(5) Prescribed vessel plans which include a general arrangement, midship section, schematics of the liquid and vapor cargo piping, and a firefighting and safety plan.

The application is then reviewed. Particular attention is paid to the containment system design, compliance with the special design areas, authorized cargoes, notes from the administration issuing the Certificate of Fitness, and compliance with applicable amendments to the IMO Gas Carrier Code. Based on this, a Cargoes and Restrictions List (Subchapter O Endorsement) is issued which makes reference to the vessel's current IMO Certificate of Fitness and provides information on operating the vessel in U.S. waters.

Once the Cargoes and Restrictions List is generated, the vessel is eligible to undergo an LOC examination. Notice should be provided to the local OCMI as mentioned above and, upon successful completion of the examination, the LOC is issued for a period of 2 years.

Figure 4


LOC Application
IMO Certificate of Fitness
Verification Special Areas Are Met
Description of Vessel
Specifications for the Cargo Containment System
Prescribed Vessel Plans
LOC Application Acceptance
Cargoes and Restrictions List Issued
Successful LOC Exam
LOC Issued (2 Years)

A vessel possessing an LOC also is subject to the general requirement that all foreign-flag tankers operating in the United States undergo an annual Tank Vessel Safety Examination (TSVE). The scope of the LOC examination includes those items normally covered during a TVSE; therefore, the examinations are conducted concurrently when the LOC is issued. One year following the LOC examination, the TVSE is conducted, and the results are recorded on the reverse side of the LOC form.

Concept Review of Novel Liquefied Gas Containment Systems

The Coast Guard has enjoyed a long and beneficial involvement in "concept review" of liquefied gas containment systems. Concept review is a pre-construction Coast Guard/Industry design consultation available to U.S. vessel designers and designers of foreign-flag vessels intended for trade in the United States. The purpose of the review, as outlined in figure

5, is to confirm the design meets the following criteria:

(1) The concept is rational.

(2) The design contains no "fatal" flaws.

(3) The design is capable of meeting U.S. standards.

Though not required by the Coast Guard, this exchange of information prior to construction facilitates later acceptance of the design for U.S. service. It also enables Coast Guard personnel to remain abreast of state-of-the-art gas ship developments. As such, concept review is a fundamental component in the Coast Guard's ability to ensure the safe transportation of liquefied gases in U.S. ports.

Requests for concept review should be made to the Hazardous Materials Branch of the Marine Technical and Hazardous Materials Division, Coast Guard Headquarters, Washington, DC. A meeting with Coast Guard personnel shortly after submitting a design is encouraged so that containment system designers can highlight their analysis and answer preliminary questions.

Review of gas ships has traditionally been divided into two stages by the Coast Guard. First is the conceptual stage as just mentioned. Second is the "design review" stage in which a detailed review of vessel drawings is conducted after a contract is obtained. As would be expected, the first vessel built to any new design is particularly scrutinized.

The full design approval stage remains intact for review of all U.S.-flag gas ships; however, due to acceptance of IMO Certificates of Fitness in lieu of plan review, Coast Guard involvement in foreign-flag vessels is greatly diminished. A limited design review is conducted only for the containment system of the first foreign-flag ship utilizing a newly approved concept. It is conducted when application for an LOC is made. The scope of this limited design review is normally outlined in the concept approval letter.

The remainder of the first ship and all subsequent deliveries (same containment system) are demonstrated to the Coast Guard to be built to U.S. standards by submission of an IMO Certificate of Fitness and supporting items required to apply for an LOC.

Figure 5

CG Concept Review

- Concept Is Rational
- Design Has No Fatal Flaws
- Capable of Meeting U.S. Standards

Conclusion

The Coast Guard is committed to maintaining an effective program for the regulation of liquefied gas carriage in the United States. Implementation of the IMO Gas Carrier Code into our regulations has been very beneficial, particularly for regulation of "new" foreign-flag gas ships through the LOC program. The 1985 changes have streamlined LOC administrative procedures, allowing for examinations to be arranged and conducted locally with only 7 days notice. Implementation of the International Gas Carrier Code and the recommended upgrades of the IMO Existing Gas Ship Code into Part 154 will further benefit the U.S. regulatory program. Through these improvements and continued involvement at IMO, together with concept review of novel containment system designs, the Coast Guard will continue to ensure the safe carriage of liquefied gases in the United States.

Acknowledgments

A more detailed paper on this subject was presented by LT Cook at the 11th International LNG/LPG Conference and Exhibition (GASTECH 85), Nice, France. The paper, entitled "U.S. Coast Guard Program for the Regulation of New and Existing Liquefied Gas Ships," was coauthored with Dr. Anthony L. Rowek and has been published in GASTECH 85 Proceedings.

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Hurricane Warning

Why You Should Be Wary Now!

Imagine for a moment that a hurricane is coming. The sky has an ominous yellow tinge, and there is an almost eerie stillness. Birds and small animals are scurrying for shelter. You're in your car and headed for your boat. Now quickly — what's your plan of action?

Maybe you already have a comprehensive hurricane plan that you've thought out and rehearsed. Maybe you already know the safest place to secure your boat and have purchased the extra line, chain, anchors, etc. Maybe you've already installed extra cleats and chafe protectors and taken care of the myriad details that go into making a good hurricane plan. If this is the case — congratulations — you have significantly increased the chances of your boat's surviving the upcoming tempest.

But if you've never given hurricane preparation much thought, and all you're planning to do is check the docklines and maybe add a fender or two, your boat doesn't have nearly as good a chance of surviving the surging tides, waves, wind, and drifting boats that will soon be threatening the area.

Securing a boat against something as extraordinary as a hurricane requires more than just an ordinary effort on your part. There isn't much time — maybe 24 hours or less — so you can't wait until a warning has been posted to decide whether to move the boat, buy extra lines, and contemplate what should or shouldn't be stripped off of the deck. The time to formulate an intelligent plan of action is NOW.

You Can Run, But You Can't Hide

There are no guarantees when you secure your boat for a hurricane: not at a dock, not at a mooring, not in a hurricane hole, not on a trailer, not even in a storage shed ashore. The only certain way to avoid any damage from high winds and coastal flooding is to ship your boat far inland, and unless your boat is trailerable, this just isn't practical. But the chances of your boat's being damaged can be reduced considerably by choosing the most secure location possible.

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Where Will Your Boat Be Safest?

In the Water

Unless you own something the size of an aircraft carrier, don't even think about taking your boat to sea and riding out a hurricane. Any boat in the water should be secured in a snug harbor. The trick is deciding which harbors are truly snug.

There are several things to keep in mind when you're contemplating the relative merits of any harbor. One of the most important is wind direction: where will the wind be coming from? Windage is greatly reduced if the wind strikes the boat directly on the bow or, on some boats, the stern. Unfortunately, until you know exactly where the hurricane's eye will pass, predicting wind direction can only be, at best, an educated guess.

Storm surge (high water) is another consideration. It is this deadly storm surge — not wind or waves — that is responsible for wrecking most boats and causing nine out of ten hurricane-related deaths. Storm surges of 10 feet or more are not uncommon in a hurricane. So a harbor with a seawall or a harbor that is surrounded by a low bank or sandy spit may be unprotected after the water surges only a few feet.

Crowded, rock-strewn harbors are picturesque, but they may not be the best place to keep your boat in a hurricane. If a harbor is crowded, the chances of other boats breaking loose and banging into your boat are that much greater. And, should your boat come loose, would you rather have it bang into other boats, picturesque rocks, or an ugly, but soft, mudbank?

Finally, what is the bottom of the harbor like? If you plan to anchor, check your charts to see what you will be setting your anchors in. Also, water can sometimes be blown out of a harbor, leaving boats stranded briefly. Obviously, if this happens, you wouldn't want your boat to settle onto rocks. Mud — thick, gooey mud, the kind kids use to make mud pies — is good to have around in a hurricane.

At a Dock

Most boats weather hurricanes at their docks, but this is not necessarily the best place for a boat in a hurricane. Boats that were bobbing gently next to a dock before a storm sometimes wind up on top of, underneath, or sunk next to that dock. And in sailboat marinas, especially when berths are close together, masts can get hopelessly tangled and battered when the weather is on the beam.

Some docks are a better bet than others. Pilings that are rotten and splitting probably won't survive, and floating docks cannot always be trusted. A storm surge can lift a floating dock off its pilings if the pilings are too short. Dock and boats are then free to float off and wreck other boats.

But a dock — fixed or floating — that has sturdy pilings and is well-sheltered from open waters may offer a reasonable degree of protection. If you do decide to leave your boat at a dock, you'll have to do a lot more than merely check the dock lines, although this is certainly important. A second set of docklines (nylon, because it absorbs shock) should be used that are a size larger than those you are already using. A weighted heaving line, incidentally, can come in handy securing docklines in high winds.

Chafe protectors (see **Checklist**) must be on all lines at the chocks and any other potential chafe points. Lines should be led to pilings that are as far away as possible to accommodate tidal surges of 10 feet or more.

Obviously, you should arrange docklines to minimize the chances of the boat's coming in contact with pilings. Nonetheless, fenders and fenderboards are essential — the more the better. If possible, space them along the entire length of the hull.

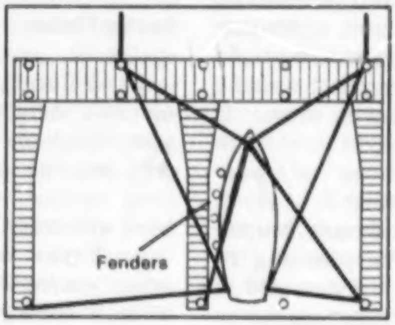


Figure 1. The longer the docklines, the better a boat will be at coping with high tides. It is also essential to double up on all lines and use chafe protectors at any potential chafe points.

If your boat is docked in a marina, nobody, even in the best of marinas, should entrust their boat's hurricane preparation to marina personnel. For one thing, they are very busy, and besides, they probably won't do as good a job as you will.

But after the tempest has past, roads will proably be blocked, and you will almost certainly have to place some trust in your marina manager. Will he have a crew ready to move damaged boats, pump flooded bilges, secure lines, guard against vandals, etc., or will he walk up and down the battered docks shaking his head, drinking coffee, and waiting for you to show up? Talk to your marina's owner now and encourage him to plan ahead.

At a Mooring, at Anchor, or Both

Mooring or anchoring, especially in a harbor that isn't too crowded, is a good bet for many boats. For one thing, a boat can swing to face the wind, which reduces windage. And a boat that's anchored or moored in open water won't bang into a dock unless, of course, the anchor or mooring drag.

The chances of the boat's dragging can be reduced considerably by using a mooring that has been inspected recently (either by you or a competent diver) along with two storm anchors. This increases the mooring's holding power and decreases the room a boat will need to swing (see figure 2). A third storm anchor can be used instead of the mooring.

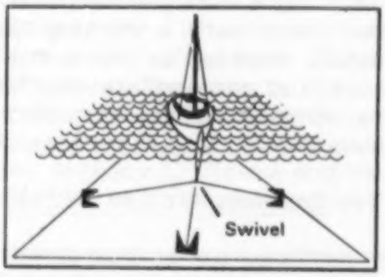


Figure 2. Using three anchors set 120 degrees apart allows the boat to swing and face the wind. This is an especially good technique in crowded harbors because the boat will not swing in as wide an arc as a boat that is riding on only two anchors.

In either case, it is important to have plenty of scope — at least 10:1 — and a lot (the more the better) of heavy, oversized chain. The scope on a mooring can be increased by lengthening the mooring pennant. A riding weight, or sentinel (see figure 3), placed at the nylon/chain juncture, will lower the angle of pull on the anchor and reduce jerking and strain on the boat.

Obviously, you'll want to use an anchor which is suited to the bottom (mud, sand, etc.) where you'll be anchoring. Use anchor sizes that are well above the weights you normally use.

Hurricane Holes

A hurricane hole — deep and narrow, with lots of young, sturdy trees along high, sheltering banks — is the ideal place to leave your boat in a hurricane. To be ideal, the hurricane hole should be far enough inland to provide shelter from high coastal winds and tidal surge but not so far as to be prohibitively difficult to reach in a relatively short time.

The chances are good that you'll have to settle for a hurricane hole that is less than ideal, but this shouldn't prevent you from looking. Clever use of anchors and lines to the shore (see figure 4) increase the number of suitable holes.

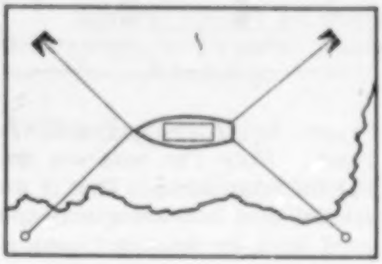


Figure 4. One of many possible arrangements that can be used to secure a boat in a hurricane hole.

Scout out the possibilities well before hurricane season, making test runs and visiting nearby landowners. If possible, try and get a written agreement with whomever owns all of the sturdy, young trees you'll be using.

You can begin your search by talking to members of the Coast Guard Auxiliary or Power Squadron to find out where the best potential hurricane holes are located. Marina owners and other boat owners are two other good sources. A few things to remember while you're looking: A hurricane hole that ordinarily takes an hour to reach may take two hours to reach when winds and seas are building. Bridges may not open as frequently when a hurricane warning is posted, or they may be locked down to evacuate cars. Also, other boats may be eyeing the same spot you've chosen.

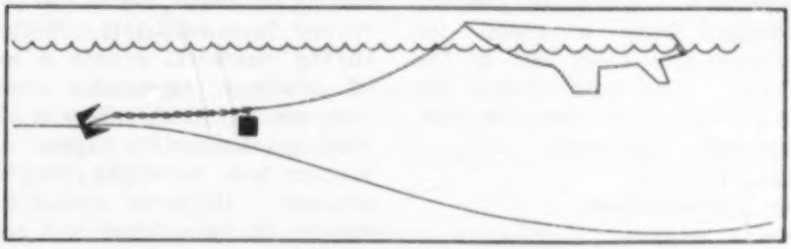


Figure 3. A riding weight or sentinel will lower the angle of pull on an anchor and also reduce the jerking motion on the boat. Some skippers object to this technique because the downward pull of the weight can prevent the bow on some boats from rising above larger waves.

Storage Ashore

Storage ashore is a must for smaller boats, especially trailerable boats. Boats that have low freeboard, such as high performance powerboats, will be safer ashore. Engines and upholstery on these boats are frequently damaged because their low freeboard is easily overcome by waves, spray, and rain. Inboard/outboard units and outboard motors are especially vulnerable to damage from docks and drifting boats. And small boats rarely have cleats and chocks that will stand up to hurricanes.

For larger boats, storage ashore is a good idea if there's time to have the vessel pulled out of the water and if it will be sheltered from high tides, falling trees, and flying debris. Remember also that a boat on shore creates more windage than the same boat in the water. This is especially true of deep-keel sailboats. And, with any boat, a cradle offers much better protection than jackstands.

Storing your boat indoors is an attractive idea if — and here's the rub — the building it will be stored in is sturdy. Many marinas have indoor storage facilities that are about as sturdy as a backyard toolshed.

Trailer Boats

A trailer is — or should be — a ticket to take your boat inland, far from the storm surges, waves, and high winds that pound the coast. But your boat won't get far on a neglected trailer that has two flat tires and rusted wheel bearings. Inspect your trailer regularly to make sure it will be operable when it's needed.

If you take your boat home, you may want to leave it, and not your car, in the garage. A boat is lighter and more vulnerable to high winds than a car. If this isn't practical, put boat and trailer where they will be sheltered from wind, falling branches, flying gravel, etc.

Let some of the air out of the trailer tires and block the wheels. You can increase the weight of lighter outboard boats by leaving the drain plug in and adding water with a garden hose (rain will add a lot more). This has the added advantage of giving you emergency water (non-drinking) if the main water supply gets knocked out by the hurricane. You'll want to place wood blocks between the trailer's frame and springs to support the added weight. Obviously, with inboard boats, the drain plug should be removed so that the engine isn't damaged by flooding.

Secure the trailer, either to trees or a deadman anchor. (A deadman anchor is any object that can be secured into the soil.) Strip all loose gear, bimini tops, canvas covers, electronics, etc., and then lash the boat to the trailer.

Critical Points Checklist

☐ Cleats and Chocks

Many boats suffer from having cleats and chocks that are woefully inadequate. This problem becomes critical when a second set of larger diameter lines is used with the existing lines. If necessary, add more and larger cleats and chocks now — they'll come in handy all year.

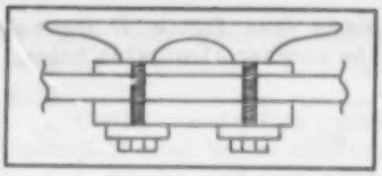


Figure 5. A properly backed cleat. Note the washers and the backing plate. This is essential in a hurricane and is a good idea in quieter times as well.

Assess the ability of cleats and chocks to carry heavy loads. This means making sure that all are backed properly with stainless steel or aluminum plates or, at the very least, large diameter washers (see figure 5). On sailboats, winches and even keel-stepped masts can also be used to secure lines.

Don't lead too many lines to a single cleat. If the cleat goes, the boat will soon follow. Also, a cleat is not reliable when lines are led perpendicular to the cleat's base. The cleat can be wrenched out by the heavier loads (see figure 6).

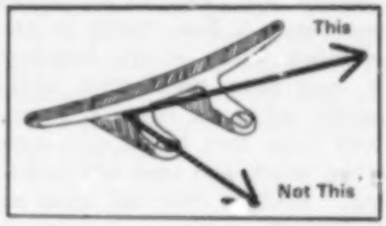


Figure 6. Lines led perpendicular from a cleat can wrench the cleat out of the deck. Two-hole cleats are more vulnerable than the four-hole cleat pictured.

☐ Chafe Gear

Chafe protectors are essential on all lines — at a dock, at a mooring, or at anchor. Lines that aren't adequately protected will almost certainly chafe through. Ready-made chafe protectors are available through BOAT/U.S., or you can make your own using neoprene hose or heavy canvas.

For a super system, if your chocks are large enough, fit a second, larger diameter hose around another hose that fits snugly to the line. Drill holes in both hoses and use cord to tie them securely to the line. In a pinch, you can use a single hose.

If you need chafe protection quickly, use a lot of duct tape to secure several layers of heavy canvas fabric to the lines. This system won't be as rugged as neoprene hose, but it is certainly better than leaving the line unprotected. The traditional method of sewing the canvas securely onto the line takes more time but is also a good technique.

☐ Stripping the Boat

Before leaving the boat, strip all gear that will create windage: canvas covers, bimini tops, outriggers, antennas, anchors, running rigging, booms, life rings, dinghies, (portable) davits, etc. Remove cowl ventilators and seal the openings. Anything else on deck that can't be taken off should be lashed securely.

Sails, particularly roller furling headsails, should be removed from sailboats. Roller furling headsails create a lot of windage, especially when they are unfurled, which is almost guaranteed to happen no matter how carefully they're secured. Halyards should be run to the masthead and secured with a single line led to the rail. This reduces windage and minimizes flogging damage to the mast. The line can be used later to retrieve the halyards.

Loose gear down in the cabin should be removed from cabinets and the cabinet doors secured. Take all electronics off of the boat. Not only can they be damaged by water, electronics are also the first to go when vandals crawl aboard. Use duct tape around hatches, ports, lockers, etc., to prevent water damage below.

Close all but the cockpit drain seacocks and bang a plug into the engine's exhaust pipe to prevent water getting into the exhaust pipe and up to the engine's cylinders.

Finally, collect all ship's documents and take them home for safekeeping.

A Boating Buddy

It is nice to have friends, especially when a hurricane is coming and you're out of town or sick. At such a critical time, you need a very special friend. You need a friend who is familiar with your boat's hurricane plan and can implement it in your absence. You need a boating buddy.

A friend who is reliable and lives near your boat makes the best boating buddy. Make sure the friend is familiar with your boat's idiosyncrasies (a sticky starter?) and has a set of keys to your boat. If possible, rehearse your hurricane plan with your buddy, including visits to alternate docking sites or hurricane holes. ⚓

An Essay Contest -- An Opportunity To Speak Out

RADM W.F. Merlin
Chief, Office of Command, Control and Communications
U.S. Coast Guard

The evolution of the merchant marine community and the Coast Guard is intertwined throughout the history of this great land. The Naval Institute has just announced a prize essay contest, "What Does the Future Hold for the Coast Guard?", and it is only natural that those of you who serve the maritime needs of this country have an opportunity to speak out on this theme. I encourage you to participate. Three cash prizes of $1,000, $750, and $500 will be awarded, and other entries may be purchased for publication as well.

Essay Contest Rules

1. Articles must be original and no longer than 3,500 words.

2. All entries should be directed to Editor-in-Chief, **Proceedings** (USCG Contest), U.S. Naval Institute, Annapolis, MD 21402.

3. Articles must be received on or before 1 November 1986 at the U.S. Naval Institute.

4. Letters notifying the award winners will be mailed on or about 1 January 1987.

5. All articles should be typewritten, double-spaced, and on 8-1/2 x 11 paper.

6. The winning articles will be published in **Proceedings** (published by the Naval Institute, not to be confused with this magazine). Some entries not awarded a prize may be selected for publication. The authors of such articles shall be compensated at the rate established for the feature for which they are bought.

7. The Naval Institute's Editorial Board will judge the competition.

You see the Coast Guard from a slightly different perspective from the rest of our fraternity, and I encourage you to share your unique view with the maritime community served by the Naval Institute. Good luck. I look forward to seeing your work in print. ⚓

SOLAS, Steering Gear, and 1986

LT Peter L. Randall

Reliable steering gear is vital to the safety of a ship, its personnel, and the marine environment. As the result of a number of major marine casualties, considerable effort has been directed toward improving both domestic and international steering gear standards. On September 1, 1984, the first set of amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS) became effective. SOLAS Regulations II-1/29 and II-1/30 represent a major upgrading of steering gear requirements for commercial vessels in international service. September 1, 1986 is significant in these regulations, as it marks the end of relief from certain failure criteria for **new** SOLAS vessels. It also marks the deadline for **existing** tankers, chemical tankers, and gas carriers (referred to in this article as tankers) to comply with certain requirements.

These regulations have already had an impact on the marine community, as many owners, operators, and designers have anticipated the deadlines and have already made necessary changes. Others are modifying their vessels and designs at this time. The following is a brief, "heads-up" synopsis of the SOLAS steering gear regulations effective September 1, 1986. It includes the applicable regulations and a brief discussion of what each regulation means to U.S.-flag vessels with SOLAS Certificates.

September 1, 1986 Deadlines for New U.S.-Flag Construction

SOLAS REGULATION II-1/29.6

6.1 Where the main steering gear comprises two or more identical power units, an auxiliary steering gear need not be fitted, provided that...

6.1.3 the main steering gear is so arranged that after a single failure in its piping system or in one of the power units, the defect can be isolated so that steering capability can be maintained or speedily regained.

6.2 The Administration may, until 1 September 1986, accept the fitting of a steering gear which has a proven record of reliability but does not comply with the requirements of paragraph 6.1.3 for a hydraulic system.

Comments on Regulation II-1/29.6. All ships are required to have a main steering gear and an auxiliary steering gear, so arranged that the failure of one of them will not render the other one inoperative. Regulation II-1/29.6.1.3 further refines this requirement for dual power hydraulic steering gears by applying a single failure criteria to the entire hydraulic system, except the actuators. Dual power hydraulic systems that have traditionally been accepted, but cannot withstand the single hydraulic component failure criteria or provide the rapid resumption of steering, will no longer be acceptable for new installations after September 1, 1986. This assumes that an indepenent auxiliary steering gear is neither provided nor required by another regulation.

SOLAS REGULATION II-1/29.16

Every tanker, chemical tanker or gas carrier of 10,000 gross tonnage and upwards shall, subject to paragraph 17, comply with the following:

LT Peter L. Randall is a Staff Engineer in the Coast Guard's Engineering Branch, Hazardous Materials Division, Office of Marine Safety, Security and Environmental Protection.

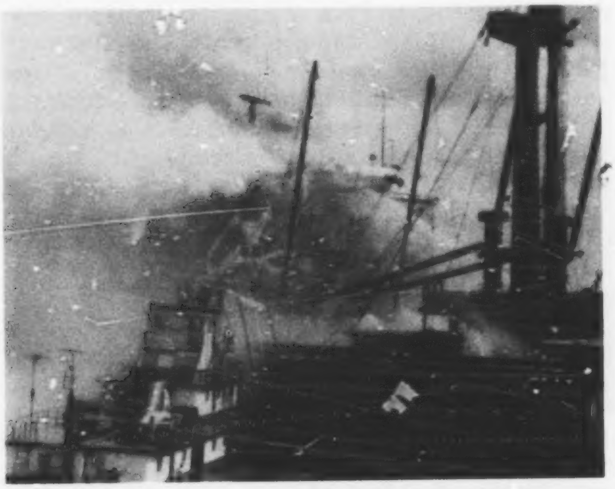
16.1 the main steering gear shall be so arranged that in the event of loss of steering capability due to a single failure in any part of one of the **power actuating systems** (emphasis added) of the main steering gear, excluding the tiller, quadrant, or components serving the same purpose, or seizure of the rudder actuators, steering capability shall be regained in not more than 45 seconds after the loss of one power actuating system;

16.2 the main steering gear shall comprise either:

16.2.1 two independent and separate power actuating systems, each capable of meeting the requirements of paragraph 3.2; or

16.2.2 at least two identical power actuating systems which, acting simultaneously in normal operation, shall be capable of meeting the requirements of paragraph 3.2. Where necessary to comply with this requirement, interconnection of hydraulic power actuating systems shall be provided. Loss of hydraulic fluid from one system shall be capable of being detected and the defective system automatically isolated so that the other actuating system or systems shall remain fully operational;

16.3 steering gears other than of the hydraulic type shall achieve equivalent standards.



This vessel, the INCA TUPAC YUPANQUI, suffered a loss of steering on the Mississippi River. It collided with a butane dock and barge, resulting in twelve deaths in the ensuing explosion and fire. (Photographer unknown)

SOLAS REGULATION II-1/29.17

For tankers, chemical tankers or gas carriers of 10,000 tons gross tonnage and upwards, but of less than 100,000 tons deadweight, solutions other than those set out in paragraph 16, which need not apply the single failure criterion to the rudder actuator or actuators, may be permitted provided that an equivalent safety standard is achieved and that:

17.1 following loss of steering capability due to a single failure of any part of the piping system or in one of the power units, steering capability shall be regained within 45 seconds; and

17.2 where the steering gear includes only a single rudder actuator, special consideration is given to stress analysis for the design including fatigue analysis and fracture mechanics analysis, as appropriate, to the material used, to the installation of sealing arrangements and to testing and inspection and to the provision of effective maintenance. In consideration of the foregoing, the Administration shall adopt regulations which include the provisions of the Guidelines for Acceptance of Non-Duplicated Rudder Actuators for Tankers, Chemical Tankers and Gas Carriers of 10,000 Tons Gross Tonnage and Above but Less than 100,000 Tons Deadweight, adopted by the Organization.

SOLAS REGULATION II-1/29.18

For a tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards but less than 70,000 tons deadweight, the Administration may, until 1 September 1986, accept a steering gear system with a proven record of reliability which does not comply with the single failure criterion required for a hydraulic system in paragraph 16.

Comments on Regulations 29.16, 29.17, and **29.18.** These three regulations define criteria for tanker hydraulic steering gears that are more stringent than the general criteria of Regulation II-1/29.6.1.3 above, which applies to all new SOLAS vessels. While Regulation II-1/29.6.1.3 applies the single failure criteria to the power units and piping and requires the ability to speedily resume steering, these three regulations extend the single failure criteria to include the actuators. They also define "speedily" as being within 45 seconds after loss of the power actuating system. The 45 second criteria dictates the use of detection equipment and either remotely controlled or automatically controlled hydraulic system reconfiguration capabilities. Regulation I-1/29.17 offers some relief from the application of the single failure criteria to non-duplicated rudder actuators, e.g., rotary vane actuators, if they meet certain criteria for robust construction.

Traditional systems that cannot meet the hydraulic system single failure provisions of Regulations II-1/29.16 and 29.17 will no longer be acceptable on newly constructed tankers between 10,000 gross tons and 70,000 deadweight tons after September 1, 1986.

September 1, 1986 Deadlines for Existing U.S.-Flag Tankers, Chemical Tankers, and Gas Carriers of 10,000 Gross Tons and Over Constructed Before September 1, 1984

SOLAS Regulation II-1/29.19

29.19 Every tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards, constructed before 1 September 1984, shall comply, not later than 1 September 1986, with the following:

19.1 the requirements of paragraphs 7.1, 8.2, 8.4, 10, 11, 12.2, 12.3 and 13.2;

(Each of these is listed and commented on individually below.)

SOLAS REGULATION II-1/29.7.1

Steering gear control shall be provided...for the main steering gear, both on the navigating bridge and in the steering gear compartment;

Comments on Regulation II-1/29.7.1. This regulation is similar to the requirements that already exist in 33 CFR 164.39(c) and (f)(1), and U.S.-flag tankers should already comply.

SOLAS REGULATIONS II-1/29.8.2 and 29.8.4

Any main and auxiliary steering gear control system operable from the navigating bridge shall comply with the following:

8.2 means shall be provided in the steering gear compartment for disconnecting any control system operable from the navigating bridge from the steering gear it serves;

8.4 in the event of a failure of electrical power supply to the control system, an audible and visual alarm shall be given on the navigating bridge; ...

One of the butane barges hit by the INCA TUPAC YUPANQUI burns out of control on the Mississippi River. (Photographer unknown)

Comments on Regulations II-1/29.8.2 and 29.8.4. Regulation II-1/29.8.2 is intended to allow a remote control system to be disconnected from the steering gear it serves, thereby permitting the steering gear to be controlled by another control system. This regulation requires disconnection of the remote control **system**, not **just power** to the remote control system. This allows isolation of damaged remote control components. Regulation II-1/29.8.4 is similar to the requirements that already exist in 33 CFR 164.39(d)(3), and U.S.-flag tankers should already comply.

SOLAS REGULATION II-1/29.10

A means of communication shall be provided between the navigating bridge and the steering gear compartment.

SOLAS REGULATION II-1/29.11

The angular position of the rudder shall:

11.1 if the main steering gear is power operated, be indicated on the navigating bridge. The rudder angle indication shall be independent of the steering gear control system;

11.2 be recognizable in the steering gear compartment.

Comments on Regulations 29.10 and 29.11. These regulations are similar to requirements that already exist in 33 CFR 164.39(f)(3), (f)(4), and (f)(5) respectively, and U.S.-flag tankers should already comply. Usually, the means of communication is part of the sound-powered telephone system required by 46 CFR Subchapter J. The requirement for the rudder angle indication to be independent of the control systems is particularly important, as it permits independent indication of steering gear malfunction.

SOLAS REGULATIONS II-1/29.12 and 29.13

12 Hydraulic power-operated steering gear shall be provided with the following: ...

12.2 a low level alarm for each hydraulic fluid reservoir to give the earliest practicable indication of hydraulic fluid leakage. Audible and visual alarms shall be given on the navigating bridge and in the machinery space where they can be readily observed; and

12.3 a fixed storage tank having sufficient capacity to recharge at least one power actuating system including the reservoir, where the main steering gear is required to be power operated. The storage tank shall be permanently connected by piping in such a manner that the hydraulic systems can be readily recharged from a position within the steering gear compartment and shall be provided with a contents gauge.

The INCA TUPAC YUPANQUI casualty occurred because the vessel lacked independent control systems, such as are now required by SOLAS on tankers. In the fire which followed the collision and explosion, the vessel was burned out from the deck up. (Photographer unknown)

13 The steering gear compartment shall be ...

13.2 provided with suitable arrangements to ensure working access to steering gear machinery and controls. These arrangements shall include handrails and gratings or other non-slip surfaces to ensure suitable working conditions in the event of hydraulic fluid leakage.

Comments on Regulations 29.12 and 29.13. These are new requirements, with no comparable counterparts for existing tankers in U.S. regulations. The low level alarm has been required by 46 CFR 111.93-13(a) for **new** U.S.-flag tankers since 1982. This alarm is required for the reservoirs of the power actuating system, but it is not required for the storage tank of Regulation II-1/29.12.3. The fixed storage tank should have sufficient capacity to permit the recharge described with the reservoir level, at minimum, in the middle of its operating range. If possible, the storage tank should be located in the steering gear room, the recharge arrangements should permit immediate recharge from within the steering gear room.

SOLAS REGULATION II-1.29.19

Every tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards, constructed before 1 September 1984, shall comply, not later than 1 September 1986, with the following: ...

19.2 two independent steering gear control systems shall be provided, each of which can be operated from the navigating bridge. This does not require duplication of the steering wheel or steering lever;

19.3 if the steering gear control system in operation fails, the second system shall be capable of being brought into immediate operation from the navigating bridge; and

19.4 each steering gear control system, if electric, shall be served by its own separate circuit supplied from the steering gear power circuit or directly from switchboard busbars supplying that steering gear power circuit at a point on the switchboard adjacent to the supply to the steering gear power circuit.

Comments on Regulation 29.19. The intent of Regulations II-1/29.19.2 and 29.19.3 is to ensure that a single failure in a steering gear control system operated from the bridge will not prevent immediate restoration of steering control from the bridge. The requirement for immediate change of control systems dictates that the changeover be initiated entirely from the bridge, without personnel starting, stopping, or re-aligning steering gear equipment from the engineroom or steering gear room. In some cases, this may mean that remote pump start and stop capabilities have to be added, or that remote or automatic 6-way transfer valve operation has to be provided. Equipment added for these purposes should maintain the intended ability to function independently in the event of a single failure in the remote controls. Regulation II-1/29.19.2 raises the question of whether controls in the steering gear room, such as feedback devices, differential units, "hunting gears," and actuators for 6-way valves are required to be duplicated to meet the requirement for two **independent** control systems. Tankers constructed prior to the revision of the Coast Guard Electrical Engineerinng Regulations in 1982 have not been required to duplicate these control devices during upgrading unless their steering gears undergo substantial re-design or replacement. Control components that are not duplicated, however, should meet the criteria of SOLAS Regulation II-1/29.2.1, which calls for "robust" construction of non-duplicated components. New vessels, and vessels whose steering gear undergo substantial re-design or replacement, must duplicate **all** control system components.

Regulation II-1/29.19.4 is similar to the requirements of 33 CFR 164.39(d)(2)(ii), and U.S.-flag tankers should already comply.

* * *

General Comments on Existing Tankers. Many of the above requirements for existing tankers are the same as longstanding regulations in 33 CFR 164.39 and 46 CFR Subchapters F and J. The 33 CFR 164.39 steering gear regulations resulted from the Port and Tanker Safety Act of 1978 and already require all U.S.-flag tankers over 10,000 gross tons to comply. As a result, U.S.-flag tankers should already be in compliance with the majority of the SOLAS regulations mentioned above.

Changes to steering gear systems made solely to comply with SOLAS are not considered "major modifications," and SOLAS steering gear requirements other than those mentioned above are not applicable. These changes are **new installations** in the context of U.S. Regulations, however, and provisions of 46 CFR Subchapters F and J and 33 CFR 164.39 generally do apply to any SOLAS-mandated changes. For example, if a component is added to comply with SOLAS Regulations, the arrangement and construction of the new component should meet the applicable U.S. Regulations.

If you have any questions on SOLAS steering gear regulations, contact the Engineering Branch of the Coast Guard's Marine Technical and Hazardous Materials Division at (202) 267-0026.

Hazardous Chemical Guide Available (Again)

In the February 1986 issue of **Proceedings**, we informed our readers that the **Hazardous Chemical Data Manual** was available for purchase through the Government Printing Office. This publication proved so popular that the GPO was completely sold out of the **Guide** within weeks. However, the **Guide** was reprinted, and sufficient quantities are now available for those readers who may wish to order it.

Manual I, the **Condensed Guide to Chemical Hazards** ($14.00) can be ordered by its stock number, 050-012-00224-0. The corresponding binder ($3.50) can be ordered using stock number 050-012-00151-1.

Manual II, the **Hazardous Chemical Data Guide** ($41.00) was also reprinted. The stock number for this manual is 050-012-00215-1. Although the manual will fit in any standard 2-1/2" three-ring binder, you may order GPO's binder ($5.00) using stock number 050-012-0223-1.

Interested persons may call the Government Printing Office's purchasing department at (202) 783-3238 for details on how to order. Please note that there is an additional 25 percent charge for foreign orders.

These two manuals are part of the Chemical Hazards Response Information System (CHRIS), used by the Coast Guard in responding to hazardous material spills in or around large bodies of water.

This material originally appeared as part of the "Shipper's Clip and Save Corner" series in the ***Journal of Commerce.*** *"Clip and Save" is an exclusive* ***Journal of Commerce*** *feature. Reprinted with permission.*

Ocean Shipments of Packaged Hazardous Materials: Top Questions

Ron Bohn

Mr. Bohn is the Hazardous Materials Manager for the National Cargo Bureau, Inc. The NCB is authorized under 49 CFR 176.18 to assist the Coast Guard in administering the DOT's Hazardous Materials Regulations (49 CFR Parts 171-179) with respect to the loading and stowage of hazardous materials on merchant vessels. A certificate of loading issued by the NCB may be accepted by the Coast Guard as evidence that a vessel's cargo is stowed in accordance with statutory and regulatory requirements.

Mr. Bohn's article follows:

The following questions and answers are based on my years of responsibility for ocean shipments of packaged, containerized dangerous cargoes. The questions reflect concerns or needs frequently expressed by shippers, exporters, freight forwarders, and brokers.

1. We may be marketing our Department of Transportation regulated commodity overseas. Must we figure out the applicable international requirements or could our international freight forwarder do that for us?

The shipper has the primary responsibility to do so. It would therefore be wise to determine the international hazard classification, shipping description, packaging, labeling, etc., yourself.

Relatively few forwarders/brokers have such expertise. (It's not a requirement for a license from the Federal Maritime Commission.) The special and often technical knowledge required, the costs of maintaining a library of updated DOT regulations and international codes — plus the liability exposure — probably discourage many from taking on such special cargo responsibilities.

In such situations the shipper may consider using (1) international carriers who have established expertise and demonstrable regulatory knowledge, (2) professional consultants, and (3) freight forwarders/brokers who already serve other chemical exporters that monitor their performance.

In addition, of course, you should consult with the manufacturer of the commodity involved. (Caution: I have found that few chemists are familiar with the transportation regulations. They can, however, at least provide chemical data sheets for the product concerned. Such starting information is vital.)

2. Our shipments are going to be containerized. Is there anything special we should know about such moves?

Yes. Packaging, marking, and labeling requirements are not relaxed. All packaging units must still be marked with the regulated commodity's proper shipping name and UN number near the hazard label. The only DOT requirement that is waived is the one for the consignee's or consignor's name and address.

General segregation is given in Title 49, Code of Federal Regulations (49 CFR) Part 176. "Carriage by vessel," section 176.83, Table 2. If any segregation is required between the hazard classes in question, then those two may not be in the same container — in any quantity. **Specific** segregation applicable to individual regulated commodities is indicated in the 49 CFR's Hazardous Materials Tables, column 7c, "Water Shipments/Other Requirements" or "Vessel Stowage Requirements," depending on which table is used.

Ron Bohn joined the National Cargo Bureau, Inc., in 1985 after many years with Hapag-Lloyd (New York) as Hazardous Materials Manager. His book, ***Hazardous Materials,*** *was published in June 1985 by International Thomson Transport Press, and his monthly "Hazardous Materials" column appears in* ***Brandon's Shipper & Forwarder*** *and* ***Pacific Shipper.***

All packaging must be secured to prevent movement in any direction using "dunnage" (undefined in 49 CFR) secured to the floor. (Consult 176.76 and the Coast Guard's Marine Technical and Hazardous Materials Division, (202) 267-1577.

3. How can we determine if our commodity qualifies as a dangerous cargo? It's not regulated by DOT, so it's probably not covered internationally either. Right?

Wrong on the last part. The definitions and criteria for DOT's "hazardous materials" are not identical to the International Maritime Organization's "dangerous goods." The criteria differ significantly for flammable liquids, poisons, and corrosives. There is a basic, general parallel between the DOT class names and the IMO (formerly IMCO) class numbers, but the IMO criteria tend to be broader than DOT's.

Call them "hazardous materials" or "dangerous goods" or "regulated commodities," but be aware that they cover not only materials (mostly chemicals) but also some manufactured articles, e.g., ammunition, electric storage batteries, cigarette lighters, toy caps and fireworks, signal flares, and aerosol dispensers, to name a few.

DOT's hazard class criteria are in 49 CFR Part 173. Find specific 173 section numbers by looking up class name in 171.8, "Definitions and Abbreviations," Note 172.102(h) for DOT to IMO class conversion.

The IMDG Code describes IMO class "properties" in the preface to each class section of the Code. For 6.1 poisons, note toxicity table and definitions in section 2.1.

4. What U.S. and international regulations for ocean shipments should we have? Where can we buy them, and how do we update them?

The U.S. (DOT) regulations are in 49 CFR Parts 100 to 177 and Parts 178 to 199. The first volume mentioned sells for $19.00, the second for $15.00 when purchased from a federal bookstore or the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. (Telephone for credit card orders and information is (202) 783-3238.) Be sure to order the November 1985 edition with the blue cover.

The international ocean "regs" aren't regulations but IMO recommendations that became regs in the maritime countries that adopted the Code into their national laws. That five-volume, ring-binder set is published in London by IMO but is available in the United States with current amendments from the following sources: Labelmaster, Chicago, telephone (800) 621-5808; New York Nautical Instrument, (212) 962-4522; and Southwest Instrument Company, San Pedro, California, (213) 519-7800. The full name of the IMDG Code (still called "IMCO books" by some) is the **International Maritime Dangerous Goods Code.** (Its latest amendment, No. 22-84, became effective on July 1, 1986.) These firms also sell the 49 CFR but at a slightly higher price than the Government Printing Office.

The 49 CFR update service, using a loose-leaf version of the 49 CFR, is available on a subscription basis from such firms or organizations as AAR/Bureau of Explosives, Washington, DC, telephone (202) 639-2555; J.J. Keller Co., Wisconsin (800) 558-5011; Bureau of National Affairs, Washington, DC (301) 258-1033; and the Regulations Management Company, Vincentown, New Jersey (609) 859-0060. (Suggestion: Call for literature and prices first. By the way, the two bureaus mentioned here are not government agencies.)

5. How do we go about getting our people trained — and then keep up with regulatory developments?

Free training materials and guides plus periodic recaps of available courses are available from DOT's Training Services Branch (DHM 51), O.H.M.T., Department of Transportation, Washington, DC 20590; telephone (202) 366-2301.

My "Hazardous Materials" column appears every fourth Monday in **Brandon's Shipper & Forwarder** and **Pacific Shipper.** Larry Bierlein also recently started an excellent hazardous materials column in **Traffic Management.**

Publications that specialize in coverage of hazardous materials include the **Courier,** published by the Hazardous Materials Advisory Council; the biweekly newsletter **Hazardous Materials Transportation** by Washington Business Information, Inc., and, from London, the **Hazardous Cargo Bulletin.**

A closing suggestion: have at least one staff member specialize in regulatory matters and be responsible for keeping the 49 CFR and IMDG Code up to date. Competence and professionalism won't come from a number of people just dabbling with it. Incompetence in this area of knowledge is the one area that can result in death or serious injury.

New Publications

Merchantman? or Ship of War?

(Available from Ensign Press, P.O. Box 638, Camden, Maine 04843. Price is $18.75. Include $1.25 postage for the first book and $.75 for each additional book.)

Author Charles Dana Gibson has served the merchant mariner well by providing a history of sacrifices made by these sailors since the American Revolution. His thrust is the historical role of the merchant mariner in time of war. I particularly commend him for good organization, an excellent table of contents, and a good index. These features make this work easy to use as a reference tool.

The real strength of the work is the materials presented for the two World Wars. Mr. Gibson gives a good description of merchant marine administration and some operational activities during these wars. The author does not limit his research to the American experience but also includes information about allies and enemies when it is germane to his subject.

I do believe that the author needs to share more information concerning the sources that he used, particularly for 18th and 19th century materials. For example, on page 4 he cites an outstanding quotation from **Memoirs of John Adams** as to the value of the merchant marine, but he does not tell us the page location within this large work. Also, while addressing the 19th century, Mr. Gibson makes some broad generalizations, which may be true, but do need to be supported with source citation. For example, on page 7, he states "[merchant mariners] were highly successful, providing more of a harassment to Britain [during the War of 1812] than did our Navy." On pages 19-20, Mr. Gibson states, "Peace Negotiations [to end the Spanish-American War] started on the first of October of 1898, just four months following the start of hostilities." This cannot be. The MAINE blew up on 15 February, a blockade of northern Cuba was proclaimed on 22 April, and the Battle of Manila occurred on 1 May. All of these events occurred more than four months prior to 1 October, and at least one of these must be a hostile act.

This work is a usable research tool for the individual who can balance its information with that from other sources. *(Reviewed by Dr. Robert L. Scheina, U.S. Coast Guard Historian)*

Thermal Spray Coatings for Controlling Corrosion in Marine Environments

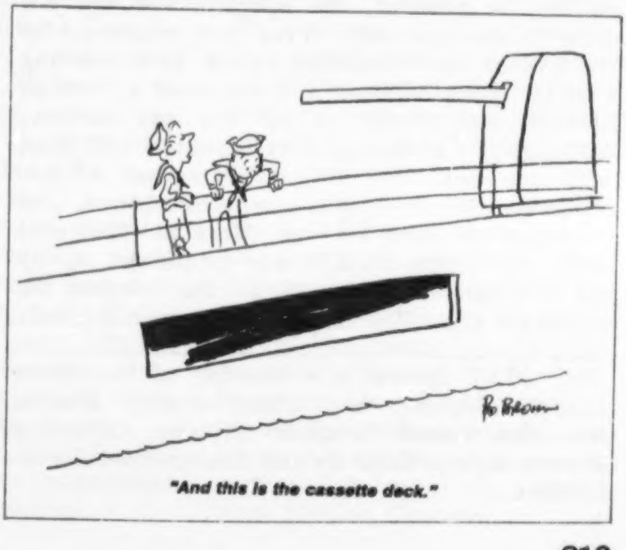
Commercial use of thermally sprayed zinc and aluminum coatings for the long-term corrosion protection of steel structures has been underway for 50 years. Over the last 10 years, increasing use has been made of thermally sprayed aluminum coatings for corrosion control on U.S. Navy ships. To understand the corrosion protection mechanisms of thermal spray coatings, the David Taylor Naval Ship R&D Center has been evaluating the coatings' performance using long-term exposures and electrochemical techniques. Long-term exposures in the marine atmosphere, the marine splash and spray zone, and under seawater immersion have been investigated for the last 3 years. Field exposure results show that sprayed aluminum coatings are capable of providing long-term, cost-effective corrosion protection for steel substrates in marine environments. *(From Navy Domestic Technology Transfer Fact Sheet, May 1986)*

Correction

In last month's issue of **Proceedings** (Vol. 43, No. 8, August 1986), an error appeared in the article, "Drugs and the Merchant Mariner," by LCDR Christopher Walter.

On page 174, the final column in Table 1 is incorrectly labeled as "1985." This column should have been labeled "Total," as it reflects the total statistics for 1982, 1983, and 1984.

Our apologies to LCDR Walter and to our readers for this typographical error.



"And this is the cassette deck."

Open Water Survival

LTJG Robert S. Spears, Jr.

Imagine yourself washed overboard into a 30-foot sea. As the personal flotation device (PFD) you donned in preparation to abandon ship forces you to the surface, you think it's all over. How can a mere mortal survive hurricane conditions in open water? Fortunately, you've managed to swim or drift to a liferaft that was launched seconds before you inadvertently followed it. You prepare to climb aboard, then hesitate — for through the spray, which is being blown by 70-knot winds, you can see an oil rig you reckon to be not more than a half-mile away. The four other crew members of your sunken tug have also found their way to the liferaft. Should you stay put or swim to the rig?

Just after dawn on August 17, 1983, a 112-foot, offshore uninspected towing vessel, the JOEL ROBIN, was being tossed about by nearly 35-foot seas and winds between 70 to 90 mph. The vessel's operator felt something was wrong with the tug's motion and directed the engineer to take a look. The engineer found the engineroom flooding. Attempts to use the bilge pumps failed, since seawater had apparently shorted them out. With the vessel sinking and no way to save it, the operator ordered the crew to abandon ship. Five men mustered on the bow of the foundering vessel, each wearing a PFD. They inflated and launched a 12-man liferaft and tended it by the sea painter. Although it was damaged by repeated collisions with the hull, the liferaft remained afloat. Suddenly, the crew was swept overboard, and they had to swim for the liferaft. Moments later, the JOEL ROBIN was swallowed up by the hurricane-tossed waters. For reasons we will never know, the first man to reach the raft decided to continue swimming, apparently headed for an oil production platform about a quarter- to a half-mile away. As the other members of the crew beckoned him to return to the liferaft, the lone swimmer disappeared and was never seen again.

The following day, the JOEL ROBIN was reported missing. The survivors were spotted by a private company's helicopter just one and a half days later. A Coast Guard helicopter recovered the men and took them to a hospital in Galveston, Texas, for treatment of exposure. Aside from one crewman who suffered a puncture from a boat hook they were in good shape. A futile search for the other crewman continued an additional day.

There are several lessons to be learned from this case. The first and foremost has to be the demonstrated need for training in open-water survival techniques. This is an established fact, and the International Maritime Organization's Standards of Training, Certification and Watchkeeping for Seafarers Convention of 1978 has outlined areas to be included in open-water survival courses. We encourage all seafarers to attend this training whether required or not, since the situation described in this article can happen to anyone. "Getting the survival craft clear of the ship" and "how to jump into the sea from a height and reduce the risk of injury when entering the water" are just a couple of the topics mariners will be exposed to in a training environment. Thereafter, if the real thing occurs, they will have the knowledge and "experience" to make the right decsion. For information about the availability of such courses, write to Commandant (G-MVP-3), U.S. Coast Guard Headquarters, 2100 Second Street SW, Washington, DC 20593. Remember, regardless of how strong a swimmer you are, the current will take you with it, and not necessarily in the direction you are heading. Your chances of survival, detection, and rescue are best if you remain in or near the survival craft.

LTJG Spears is a member of the Coast Guard's Training and Qualifications Branch, Merchant Vessel Personnel Division, Office of Marine Safety, Security and Environmental Protection.

Marine Safety Council Membership

RADM Edwin S. Daniels, Sr.

Rear Admiral Edwin H. Daniels, Sr., Chief Counsel for the U.S. Coast Guard, retired on June 30, 1986.

RADM Daniels was graduated second in the U.S. Coast Guard Academy Class of 1953 and was commissioned an Ensign. His duty stations included tours on the USCGC ABSECON, Commanding Officer of the LORAN Station Cape Christian, Baffin Island in the Canadian Arctic, and as Rescue Coordination Center in the Seventh Coast Guard District in Miami.

Following his graduation in 1963 from the George Washington University Law School, he became a member of the Bar of the District of Columbia. During his tour as Assistant Legal Officer for the Third Coast Guard District, he was temporarily assigned as Coast Guard Liaison Officer to the American Consul General in Nassau, Bahama Islands, during the Cuban crisis.

During his tour as Commanding Officer of USCGC DIGILENCE in Key West, Florida, he received the Coast Guard Achievement Medal. The Coast Guard Commendation Medal was awarded him during his tour as Legal Officer for the Seventh Coast Guard District in Miami. RADM Daniels became Commanding Officer of the Support Center on Governors Island where the Coast Guard Meritorious Unit Citation was awarded for its role in the New York Harbor Operation Sail in 1976. The Coast Guard Meritorious Service Medal was awarded RADM Daniels upon completion of his tour as "Mayor" of Support Center, Governors Island.

On March 31, 1981, RADM Daniels assumed command of the Ninth Coast Guard District, Cleveland, Ohio, and was designated as Chief Counsel for the Coast Guard in June 1981.

Other awards presented to RADM Daniels are the Coast Guard Expert Pistol Medal, the Arctic Service Ribbon, the Coast Guard Unit Citation, and the Coast Guard Commendation Ribbon. He was inducted into the Coast Guard Academy Athletic Hall of Fame in October 1976.

RADM Daniels is married to the former Rebecca Plemmons of Asheville, North Carolina. They have four children: Edwin, Jr., LT, USCG, stationed on the USCGC EAGLE in New London, Connecticut; Nan Elizabeth, Celia Catherine and Amy Susan.

RADM and Mrs. Daniels are making their retirement home in North Carolina.

Captain Robert F. Ingraham

Captain Robert F. Ingraham, Executive Secretary of the Marine Safety Council and Executive Director, Towing Safety Advisory Committee, retired from the Coast Guard on June 30, 1986. At a retirement luncheon on June 18, 1986, RADM Clyde T. Lusk, Chief of Staff of the U.S. Coast Guard, awarded CAPT Ingraham the Coast Guard's Meritorious Service Medal.

CAPT Ingraham and his wife, Grace, are returining to their home on the Nansemond River in Suffolk, Viriginia. The Captain has no immediate plans other than for some travel in the United States; however, in time he may interest himself in some facet of our maritime industries.

Editor's Note: In the year CAPT Ingraham served as Executive Secretary of the Marine Safety Council, he directly supervised the preparation of this magazine. I would personally like to thank Capt Ingraham for his commitment to the ***Proceedings*** *and for his invaluable advice on technical matters. It was a pleasure to work for you, Captain.*

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. How is the concentration of dissolved oxygen in the feedwater of an auxiliary boiler maintained at acceptable limits?

A. Feedwater is cycled through a D.C. heater.
B. Feedwater is treated with phosphates.
C. Oxygen is liberated in the three stages of feedwater preheating.
D. Oxygen is liberated by maintaining the highest practical feedwater temperature.

Reference: NAV SHIPS, Bureau of Ships Technical Manual, Section 9510

2. A pressure drop in the refrigerant liquid line in an R-12 system may cause

A. the solenoid valve to seize.
B. the compressor to hunt.
C. flash gas to form in the liquid line.
D. the expansion valve to freeze open.

Reference: Gunther, Refrigeration, Air Conditioning and Cold Storage

3. Which fuel nozzle requires the LEAST maintenance?

A. Pintle
B. Singlehole
C. Multihole
D. Open

Reference: Stinson, Diesel Engineering Handbook

4. Distribution of lubricating oil throughout a turbine bearing is generally accomplished by the

A. oil wedge.
B. micrometer valves.
C. oil grooves in the bearing.
D. relief bevel.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

5. A nickel-cadmium battery is receiving a normal charge and gases freely. The charging current should

A. be increased.
B. be decreased.
C. be cut off and the battery allowed to cool.
D. remain the same.

Reference: Hubert, Preventive Maintenance of Electrical Equipment

DECK

1. Which of the following materials is most likely to cause compass error when carried in the vicinity of a magnetic compass?

A. Brass
B. Aluminum
C. Lead
D. Steel

Reference: Bowditch, American Practical Navigator

2. Under the IALA-B buoyage system, a square daymark would be colored

A. green.
B. red.
C. green and white.
D. black and white.

Reference: Bowditch, American Practical Navigator

3. Deviation changes with a change in

A. depth.
B. heading.
C. wind conditions.
D. sea conditions.

Reference: Bowditch, American Practical Navigator

4. A vessel 1 point on your starboard bow would be

A. dead ahead.
B. 11.25° relative.
C. 45° relative.
D. 78.75° relative.

Reference: Bowditch, American Practical Navigator

5. Sixty (60) fathoms is marked on the anchor chain by

A. one turn of wire on the first stud from each side of shackle.
B. two turns of wire on the second stud from each side of shackle.
C. three turns of wire on the third stud from each side of shackle.
D. four turns of wire on the fourth stud from each side of shackle.

Reference: Merchant Marine Officer's Handbook

ANSWERS

ENGINEER
1-D;2-C;3-A;4-C;5-D
DECK
1-D;2-A;3-B;4-B;5-D

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417. ⚓

Keynotes

Final Rule

CGD 79-077, Workplace Safety and Health Requirements for Facilities on the Outer Continental Shelf (July 10)

The Coast Guard is issuing regulations concerning personal protective equipment and general working conditions on Outer Continental Shelf (OCS) facilities. These regulations address the need identified in the OCS Lands Act Amendments of 1978 to promote safe working conditions by regulating hazards in the workplace. This rule is part of a continuing effort by the Coast Guard to improve safety of life and property on the OCS.

The rule is effective on January 12, 1987.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 267-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours. ⚓

American Seamanship Trophy for Rescue of Ten During Hurricane

Captain James Edward Bise and the crew of an integrated tug-barge, ITB BALTIMORE, have won the 1986 American Merchant Seamanship Trophy Award. They were cited for distinguished seamanship in rescuing 10 survivors from two sailing vessels lost or disabled in the West Indies during Hurricane Kate in November 1985.

In announcing the selection, John Gaughan, Maritime Administrator of the U.S. Department of Transportation and Chairman of the Select Committee for this prestigious award, said,

> *The Master and members of the crew of the ITB BALTIMORE, with extraordinary skill and courage, maneuvered their vessel in stormy seas and at great risk to their own safety, to effect not one, but two, rescues several miles and hours apart. Their feat was all the more remarkable when one considers that this class of vessel (the integrated tug-barge) is difficult to maneuver even in ordinary seas.*

Each of the wrecked sailing vessels, the 42-foot yacht TAXI DANCER and the 65-foot, two-masted ketch SUNQUEST, had five people aboard when they were caught in the hurricane. All were brought safely aboard the 47,000-deadweight-ton tanker, which is owned and operated by the Berger Group of shipping companies of Lake Success, New York.

The ITB BALTIMORE, loaded with jet fuel, gasoline, and heating oil, maneuvered directly alongside small craft to bring the 10 crew members aboard.

The Seamanship Trophy was established in 1962 by the U.S. maritime community to honor acts of distinguished seamanship by American citizens. This perpetual cup is preserved as a permanent tribute to deeds of extraordinary American seamanship and maritime skill. A unique award, it is not necessarily given every year. There was none last year, for example; the Select Committee (comprised of maritime labor, management, and government representatives) having determined that nominations fell short of the high standards established over the previous 23 years.

The 1986 award is the 19th in the series. It recognizes achievements of American seafarers in calendar year 1985.

As defined by the Select Committee, "distinguished seamanship" includes either a distinguished act of professional competence" in the presence of extreme peril to life or property, or an outstanding feat of seamanship exemplifying the highest standards of professional competence under severe, adverse weather conditions.

The award is given only to American seafarers, not to a company or institution.

The Seamanship Trophy normally remains in the possession of the awardee for half the calendar year from the date of presentation and otherwise is on permanent display at the American Merchant Marine Museum located on the grounds of the U.S. Merchant Marine Academy at Kings Point, NY.

The saga of the ITB BALTIMORE is told in an official citation to the captain and crew which will be displayed with the trophy.

The citation reads as follows:

On November 17, 1985, Captain Ed Bise and the crew of the integrated tug-barge BALTIMORE located and rescued 10 survivors of two boats sinking in furious seas caused by Hurricane Kate. Five crew members of the 42-foot-yacht TAXI DANCER were pulled from their capsized vessel. Within 2 hours, the BALTIMORE crew rescued all five crew members of the 65-foot, two-masted ketch SUNQUEST from a liferaft, [the crew members] having abandoned their vessel 14 hours earlier.

They performed the tremendously difficult task of bringing their 47,000 dwt tanker, loaded with jet fuel, gasoline, and heating oil, directly alongside small craft to effect the rescues, with extraordinary maneuvering of a vessel which is difficult to maneuver in ordinary seas.

Captain Ed Bise and the crew of the BALTIMORE performed these heroic feats in a selfless manner, ignoring their own peril in the face of immediate and present danger. In the highest tradition of seafaring they came to the aid and rescue of their fellow mariners, bringing aboard all crew members. They performed the tremendously difficult task of bringing their 47,000 dwt. tanker, loaded with jet fuel, gasoline, and heating oil, directly alongside small craft to effect the rescues, with extraordinary maneuvering of a vessel which is difficult to maneuver in ordinary seas. Captain Bise and his crew exhibited the highest level of distinguished seamanship.

At midnight on November 17, 1985, the BALTIMORE was about 200 miles north of St. Croix, V.I., bound for Port Redding, New Jersey, and amid Hurricane Kate. At 0300 hours, the Second Mate heard the first of several garbled messages from a Coast Guard search plane. It reported a vessel in distress. Before a position could be given, the message faded out. His efforts to contact the Coast Guard in San Juan were to no avail. After two and one-half hours of fruitless effort, he tried and succeeded in reaching Radio WOO (a long-range commercial station) in southern New Jersey. They patched him through to San Juan Coast Guard, which relayed the TAXI DANCER's position.

Six hours later, after diverting his ship, Captain Bise sighted the stricken TAXI DANCER. After difficult maneuvers to prevent the small craft from being crushed against the hull, BALTIMORE's Chief Engineer and First Assistant took deck positions to pull the survivors aboard.

Waves were breaking over the BALTIMORE's bow. Winds were buffeting the Second Mate, who was handling the Kilgore gun. Three shots were fired before a line could be secured to the TAXI DANCER. Survivors underwent a scary ordeal scaling the Jacob's ladder to BALTIMORE's wave-lashed deck. The rescue was completed by 1100 hours.

About two hours later, the BALTIMORE reached the liferaft of the SUNQUEST, which had radioed earlier via an ingeniously repaired EPIRB antenna on the liferaft.

A crew member, with the aid of a pair of scissors from the first-aid kit, cut a spiral metal strip from a soft-drink can and fashioned a replacement for the antenna which was lost in the fury of the hurricane.

After three perilous tries, and despite a snapped mooring line, the raft was brought alongside and its crew members struggled aboard the BALTIMORE.

By 1400 hours, some five hours after the first rescue was begun, and eleven hours after the BALTIMORE had diverted its course to find the TAXI DANCER, it headed north to resume the journey to Port Redding, New Jersey. The collective crews of the TAXI DANCER and SUNQUEST were safely on board.

(Each of the vessels had been bound from Bermuda — the TAXI DANCER for St. Maarten; the SUNQUEST for St. Thomas — when they encountered the hurricane. The TAXI DANCER had turned turtle, lost its mainsail, mizzen, and booms, then righted itself and was kept afloat for 16 hours by the crew until the BALTIMORE arrived. Some four hours after the TAXI DANCER was disabled, the crew of the SUNQUEST lost control of the ketch. It broke up, and around midnight the crew took to the liferaft.)

The extraordinary seamanship skills of Captain Bise and the heroic, persistent and gallant efforts of his crew under extreme weather conditions uphold the highest traditions of the sea. In saving human life and in the demonstration of the most excellent qualities of seamanship, Captain James Edward Bise, Jr., and the crew of the ITB BALTIMORE qualify as the winner of the 19th American Merchant Marine Seamanship Trophy Award."

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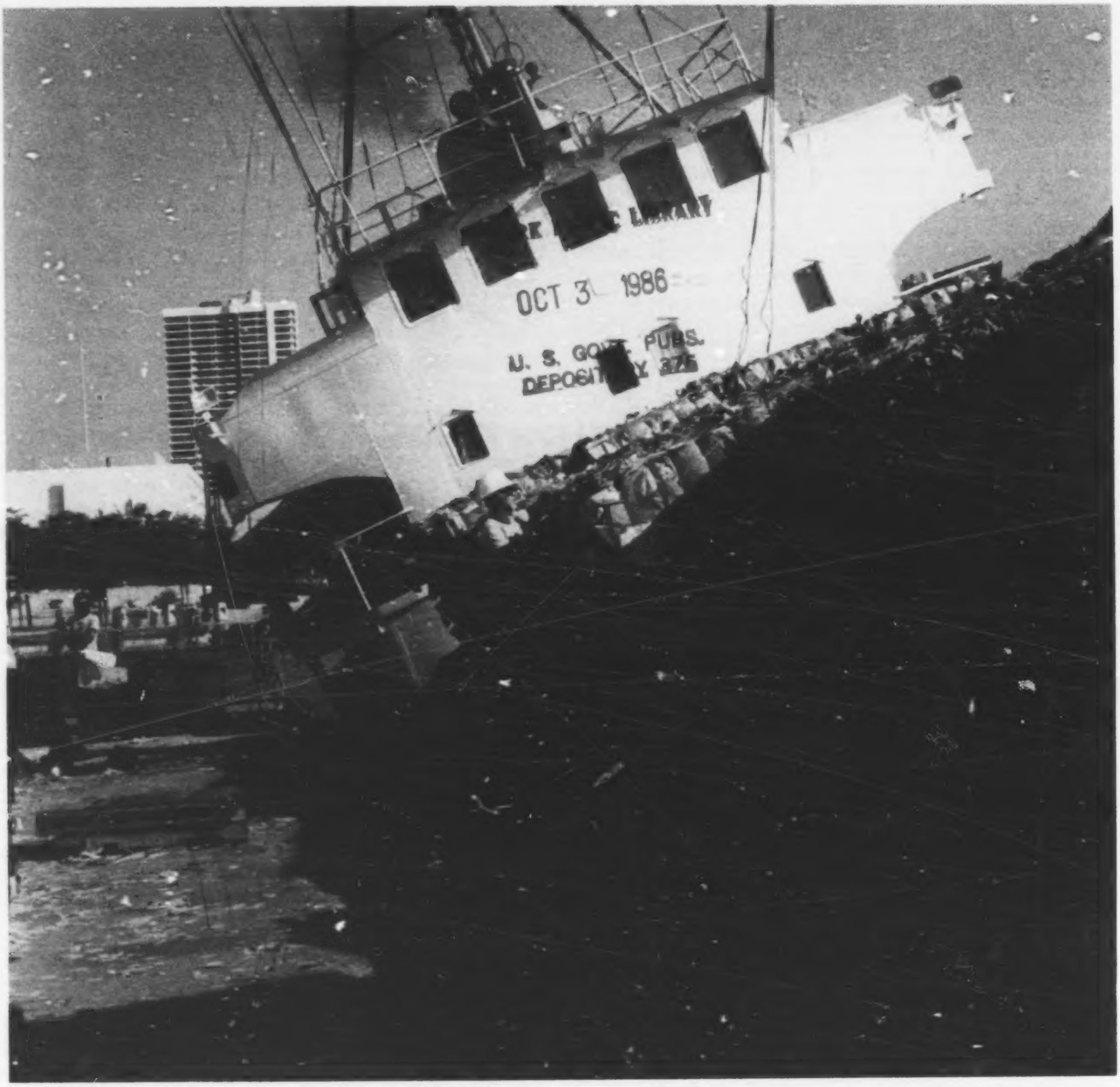

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Admiral Paul A. Yost, Jr., USCG
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Cover

This Caribbean coastal freighter was loaded incorrectly and nearly capsized. Frank Perrini's article, beginning on page 223, gives an overview of the load line issue. *(Official U.S. Coast Guard photo)*

Load Lines in the Caribbean Trade

Frank Perrini

Many small coastal freighters plying the waters of the Caribbean are registered in countries which are not party to the International Convention on Load Lines, 1966 (ICLL 66). Their cargoes are usually general in nature. Some vessels specialize in the carriage of bulk cargo, such as grain, or containers. Most of these vessels are in "tramp" service, having no set schedules and engaging in business wherever available. These vessel operations have gravitated to the Caribbean area because of the temperate climate and sheltered waters there and the relationship of many of the local countries with regard to the international conventions.

Some vessel owners, operators, and agents are not aware of U.S. load line requirements, nor do they know where to obtain such information. This article gives the maritime community a condensed overview of load line history, administrative procedures for obtaining freeboard assignment, and the technical requirements for certification. A few of the typical load line problems, based on actual experiences, are mentioned to assist the prospective owners/agents in avoiding expensive vessel delays.

The Coast Guard Office of Marine Safety, Security and Environmental Protection is responsible for the administration of the load line program which is designed to protect life, property, and the marine environment. Through Coast Guard oversight efforts, load line enforcement and the level of standards applied to vessels entering U.S. waters are being improved.

International Load Lines

Today there exist two load line conventions, the ICLL 66 and the 1930 Convention, the precursor of the ICLL 66. Over 100 nations of the world are party to the ICLL 66; the remaining nations are either party to the 1930 Convention or not party to any convention. The two treaties provide uniform load line standards of freeboard, conditions of assignment, watertight integrity, strength, and protection of the crew. Stability and strength standards are specified by the national administrations. Strength standards are usually based on classification society rules. The ICLL 66 applies to vessels over 79 feet in load line length engaged on international voyages.[1] Nations which are party to the conventions are obligated to require their flag vessels to meet convention standards and to enforce them via annual and periodic (5-year) load line surveys. They also agree to enforce these standards on foreign vessels in their home waters.

The 1930 Convention applies to vessels of 150 gross tons or more on international voyages. Gross tonnage is the vessel's volume cargo capacity determined by admeasurement rules. A few countries still utilize the 1930 Convention. Older vessels which were originally load lined under the 1930 Convention are known as "existing" vessels under the ICLL 66 and are permitted to retain the same standards provided the freeboard is not decreased and no

---

Mr. Perrini is a Staff Naval Architect in the Marine Technical and Hazardous Materials Division, U.S. Coast Guard Headquarters.

[1] *The load line length is defined as 96 percent of the total length on a waterline at 85 percent of the least molded depth measured from the top of the keel, or the length from the fore side of the stem to the axis of the rudder stock on that waterline, if that be greater.*

other changes are made which reduce safety.

The load line assigning and issuing authorities are usually one of three categories:

- the national administration or home government
- an international classification society
- other non-government agencies (i.e., private surveyors)

National administrations often delegate load line functions to either classification societies or private surveyors. All of these load line agents acting on behalf of national administrations must receive appointment and authority from the governments to do so.

The primary functions of load line assigning authorities are as follows:

- calculation of freeboards
- determinations of conditions of assignment (i.e., requirements for vents, coamings, hatches, guardrails, etc.)
- periodic surveying and reporting
- annual inspection and reporting
- certification
- load line hull marking verification

Table 1, a partial list of nations and possessions in the Caribbean area, indicates their current status (as of the date of this article) with regard to the ICLL 66:

Table 1

Party Nations	Non-Party Nations	Possessions To Which the ICLL 66 Has Not Been Extended
Bahamas	Cayman Islands	Montserrat (UK)
Barbados	Colombia	St. Vincent and the Grenadines (UK)
Brazil	Costa Rica	Turks and Caicos Islands (UK)
Cuba	Guatemala	
Dominican Republic	Haiti	
Honduras	Nicaragua	
Jamaica	Paraguay	
Mexico		
Panama		
Trinidad and Tobago		
Venezuela		

U.S. Load Line Policy

The United States is party to the 1966 Convention and is no longer party to the 1930 Convention as suggested in Recommendation 1 of the ICLL 66. In the Caribbean, the United States has extended its party status to Puerto Rico and the U.S. Virgin Islands. Under the International Voyage Load Line Act of 1973, vessels arriving or departing from any port or place within the jurisdiction of the United States are subject to load line requirements. The load line regulations are found in Title 46 of the Code of Federal Regulations, Parts 42 through 46, which are known as Subchapter "E." These regulations which implement the act require foreign vessels entering U.S. jurisdictional waters to have either a valid ICLL 66 certificate, issued under the authority of a nation which is party to the ICLL 66, or to meet equivalent standards. Foreign vessels registered in countries which are not party to the ICLL 66 must obtain a U.S. load line certificate in order to prove equivalency. This certificate, commonly known as a "Form B," is authorized for issuance by the U.S. Coast Guard and is valid only for use in U.S. waters.

The United States recognizes the American Bureau of Shipping as its primary load line assigning and issuing authority. Other classification societies that are recognized to act as assigning authorities on a case-by-case basis at the request of vessel owners are as follows:

Bureau Veritas

Det Norske Veritas

Germanischer Lloyd

Lloyd's Register of Shipping

Registro Italiano Navale

In order to satisfy both the ICLL 66 and the Safety of Life at Sea Convention (SOLAS) stability requirements, all vessels loading grain at U.S. ports must obtain a Document of Authorization and Certificates of Loading from the National Cargo Bureau. The Document of Authorization verifies that the vessel's grain stability booklet meets the requirements of Chapter VI of SOLAS. The Certificate

This Caribbean coastal freighter was loaded incorrectly, nearly resulting in the vessel's capsizing. The photo shows the vessel undergoing corrective unloading/loading. (Official U.S. Coast Guard photo)

of Loading is required each time the vessel loads, attesting that the grain is loaded in accordance with SOLAS standards.

General Load Line Problems in the Caribbean Trade

A few countries which are party to the ICLL 66 appoint private corporations to act as load line assigning and issuing authorities, some of which apply lax standards. Under Article 21 of the ICLL 66, the Coast Guard is obligated to enforce certain load line standards to ensure that foreign vessels are "fit to proceed to sea." Therefore, any load line authority acting on behalf of foreign governments which survey and certificate vessels which visit U.S. ports, fall under the scrutiny of Coast Guard field inspectors. This not only protects lives but also protects U.S. waters and waterways from pollution incidents and navigational hazards. This is particularly important if the load line standards are the only safety requirements protecting these cargo vessels from the hazards of the sea as in the case of those under 500 gross tons.

Another problem in this area is that vessel ownership and registration change frequently, sometimes several times per year. Many owners register them under foreign flags and seek Form B load lines for operation in U.S. trade. These operations present an administrative problem for the Coast Guard with regard to recordkeeping, but more important, they sometimes present safety problems for our vessel inspectors.

The photograph accompanying this article shows a typical Caribbean coastal freighter which was loading scrap paper in Miami. The vessel was from a Caribbean area nation which is party to the ICLL 66. The vessel's master loaded his vessel using intuitive judgment instead of the stability information required by the Convention. As the master loaded cargo, he pumped ballast water into the double bottom tanks to compensate for the high cargo weight. However, a deteriorated centerline bulkhead in the double bottom and a fractured vent pipe in the hold caused off-center flooding, nearly resulting in the vessel's capsizing. The problem was corrected before the vessel was permitted to put to sea. The photo shows the vessel undergoing corrective unloading/loading.

Many vessels have load lines marked with paint only, which becomes barely visible with age and corrosion. U.S. load line regulations and Regulation 8 of the ICLL 66 require that load line marks be permanently fixed on each side of the vessel and then painted with colors contrasting with the hull. The Coast Guard prefers that they are outlined either with weld beading or punch marks to ensure permanency.

Form B Load Lines

Vessels registered in countries which are not party to the ICLL 66 are required to have a Form B (U.S.) load line certificate before entering the waters of the United States, its territories, and possessions. The procedures for obtaining a Form B load line are published in the Navigation and Vessel Inspection Circular (NVIC) No. 18-82 which is available through the U.S. Coast Guard (G-MP-2), 2100 Second Street, SW, Washington, DC 20593; telephone (202) 267-1483. Provisional (temporary) certificates are issued for a period not to exceed 5 months in order to allow vessel owners sufficient time to obtain approval of the vessel's stability information. Full-term (permanent) certificates are issued for a period of 5 years. The Coast Guard's Naval Architecture Branch reviews stability information to ensure that there is sufficient information for the vessel's master to determine stability for any loading condition. No minimum level of stability is required at present.

The American Bureau of Shipping is authorized to issue provisional Form B load line certificates without prior Coast Guard approval. However, ABS must obtain authorization to issue full-term certificates. All other classification societies must obtain both an appointment to act as an assigning authority and authorization to issue both provisional and full-term certificates on a case-by-case basis for each vessel.

Load line requests for authorization and appointment of recognized classification societies should be sent to the following address:

U.S. Coast Guard (G-MTH-3)
2100 Second Street, SW
Washington, DC 20593
Telex: 892427
(Response: COGARD WASH)

Requests should be in writing (either letter or telex) and should include the following information:

- Vessel name (and former name, if known)
- Vessel ID number (classification society ID/call sign)
- Country of registry
- Requested assigning authority (classification society)
- Full name, address, and telephone/telex number of owner/agent

Form B Problems

Non-party flag vessels sailing in the Caribbean area often arrive in U.S. ports without the required Form B load line, assuming that their "home" government load line papers would suffice. In these cases, the local Coast Guard Marine Safety Office detains these vessels until the proper Form B certificate is obtained. The appropriate foreign consulate is notified of the detention. Also, vessels are frequently reflagged to a non-party nation while in a U.S. port. The number of reflagged vessels which have been idle for extended periods is increasing.

Many of these foreign-flag vessel owners expect to obtain Form B certificates immediately. We have informed vessel owners and their agents through the recognized classification societies that the Coast Guard requires at least 2 weeks of lead time to handle Form B load line requests. Load line surveys by the assigning can be time-consuming and require advanced planning. If the vessel is not classed or has not had a hull inspection in drydock within the last 5 years, a drydocking is required.

Some of the load line papers on board these vessels are either "national" certificates or ICLL 66 "look-alikes." Neither will satisfy

U.S. requirements, and the ICLL 66 "look-alike" is not permitted by the Convention itself. The "national" certificates are often issued by or on behalf of "home" governments. Often neither the issuing agents nor the home government have the expertise or facilities required to ensure ICLL 66 standards. The ICLL 66 "imitation" certificates look quite official to the untrained eye. To counter this problem, the Marine Safety Offices have been advised of their existence, and updated listings of party and non-party countries have been provided to them.

We have attempted to communicate through the State Department with nations which have issued the ICLL 66 "imitation" certificates addressing this problem. No responses have been received to date.

Vessel masters often neither understand stability nor heed stability information provided to them. Masters often rely on shoreside personnel to perform stability calculations, if they are done at all. A case similar to the mishap previously mentioned was the M/V POINCIANA which flooded until grounded while being loaded. The POINCIANA was loaded with cargo in its holds and above decks until it had negative stability. When tugs pulled the POINCIANA off ground into deeper water, it heeled over and sank, spilling a cargo of chemical pollutants into the Miami River.

Since Form B vessels change ownership frequently, vessel owners/agents have difficulty obtaining the original stability information provided to the vessel. Often the stability information submitted to the Coast Guard for approval is piecemeal, illegible, and incomplete. If owners/agents have had difficulty obtaining approval after several attempts, they are advised to seek the assistance of a naval architect who can generate the missing calculations and instructions and assemble the information into a comprehensive booklet. Stability information is often submitted with unidentifiable vessel names or names of sister vessels. In these cases, the submitters are requested to verify in writing that the stability information applies to the vessel being assigned a load line.

Many of the vessel crews are composed of several nationalities. Sometimes stability information is written in a language not familiar to the master or crew. This presents an administrative problem for the Coast Guard in specifying language requirements for approved stability information. In several cases, the Coast Guard has required the stability information to be translated.

Load Line Program Improvements

Form B policy will be changed in the near future in order to upgrade the level of safety and to reduce the administrative burden on the Coast Guard. The Coast Guard is considering a stability requirement for a Form B load line certificate in order to improve the masters' interest in and intelligent use of proper stability and loading information. A stability criteria equivalent to that required for load lined U.S.-flag vessels of the same type will be required along with verification of lightship characteristics. The Coast Guard intends to delegate the review of Form B stability and stability test data to the recognized assigning authorities. These policy changes will be reflected in a change to NVIC 18-82 or a regulation revision.

The Coast Guard's Naval Architecture Branch will periodically audit the classification societies in the performace of these delegated functions, particularly in the areas of freeboard calculation and stability review. Officers in Charge, Marine Inspection (OCMIs), under the direction of the Coast Guard's Merchant Vessel Inspection Division, will oversee assigning authority inspections, surveys, certification, and hull marking verification. A critical area of concern for inspectors is the hull watertight integrity. Hull integrity requires that all hull closures, such as shell valves, watertight doors, portlights, and hatches are properly sealed and secured. Under NVIC 2-85, assigning authorities are obligated to report load line deficiencies and violations to the local OCMI.

U.S. Customs officers in the field are usually the first to board vessels arriving in U.S. ports. The Coast Guard is often dependent on its preliminary checks of vessel papers, including load line certification. The Coast Guard has established a working relationship with the Headquarters of the U.S. Customs Service in Washington, DC, to keep that agency informed of current load line policy and events. Customs Headquarters in Washington and its training facility in Georgia have both been provided with complete load line information packages, including the treaties, laws, regulations, and policy. Customs will also be attending load line "roundtable" meetings held yearly with the recognized assigning authorities at Coast Guard Headquarters.

continued on page 232

The Sinking of the F/V ATLANTIC MIST

LCDR Christopher Walter
and
LCDR William J. Morani, Jr.

The captain of the F/V ATLANTIC MIST tried to keep his crew's spirits up that winter night in Janury 1985 as they floated through 10-foot seas in their exposure suits. He kept telling them that the Coast Guard knew where they were, that the helicopters were on their way. One man had already died; a second had just a few minutes to live.

The ATLANTIC MIST was returning to Ocean City, Maryland, after a successful clamming trip. Its hold was completely filled with its catch, and more was stored on deck. A total of over 72,000 pounds of clams were on board. This 68-foot, 110-gross-ton clammer had ten round openings in the deck, each 12 inches in diameter, that were used to shovel clams into the hold. Each of these holes was capable of being closed by a round plate which had a locking mechanism and a rubber seal to make it watertight. When the day's clamming was done, the crew secured the clamming gear, washed down the deck, and rinsed the clam loading holes. The round plates that were used to close these holes were not secured.

The Casualty

Throughout the day, the wind and seas built gradually until, in the early evening, the wind was 25 knots, and the seas reached 8 to 10 feet. Seas washing across the deck flooded down into the clam hold through the unsecured clam loading holes. At about 1930, just two and a half hours from safety, the captain noticed that the vessel was down by the stern. He opened the hold and saw that it was partially flooded with about four and a half feet of water. The captain told the mate to pump it out and then called the Coast Guard as a precaution. He told the Coast Guard Group Eastern Shore that he was flooding but not in danger at that time. As a further precaution, he ordered the crew to don exposure suits and opened the deckhouse doors to allow quick escape from the vessel.

The water that washed across the deck and flooded down into the hold through the unsecured deck openings also washed sand and debris from the load of clams. This debris settled in the bottom of the hold and clogged the suctions for the vessel's installed pumps, rendering them ineffective in controlling the flooding. The mate then attempted to use a portable pump through the deck hatch — the full load of clams kept him from getting good suction. As a result, his efforts to pump out the clam hold were not successful, and the ATLANTIC MIST continued to settle in the water. When the hold flooded completely, the engineroom began to flood through openings at the top of the bulkhead between the hold and the engineroom. When the engineroom high water alarm sounded, the captain ordered the vessel abandoned. The crew launched the liferaft on the starboard side while the captain sent a distress message to the Coast Guard. The captain then jumped off the port side and, seconds later, the ATLANTIC MIST rolled sharply to starboard, righted itself, and sank quickly by the stern.

As the master left the vessel, three of the four crewmen boarded the liferaft. They and the raft were pulled underwater by the ATLAN-

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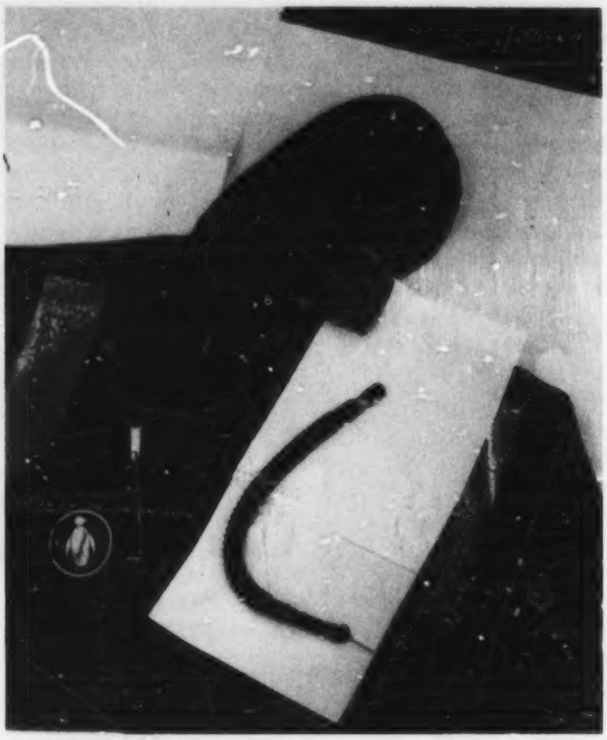
LCDR Walter is Chief of the Investigation Department, U.S. Coast Guard Marine Safety Office, Hampton Roads, Virginia.

LCDR Morani is a Member of the Coast Guard's Fishing Vessel Safety Task Force.

TIC MIST's starboard outrigger when it rolled and the outrigger outhaul block snagged the raft's canopy. One man escaped through the liferaft door, a second man escaped through a tear in the canopy. The third man remains missing and is presumed dead.



Exposure suit used on the F/V ATLANTIC MIST. Note the intact inflator tube that is used to inflate the auxiliary means of buoyancy. (Photo by the author)

Exposure Suit Problems

The company which owned the ATLANTIC MIST purchased exposure suits for the crew 6 years before the casualty. Three of the exposure suits failed to function properly because the tube which inflates the float that keeps the wearer's head upright and out of the water separated from the float. Since these suits were purchased, the Coast Guard approval standards for exposure suits were changed to require a positive means of securing the inflator tube (a clamp); the ATLANTIC MIST's suits did not have securing clamps on the inflator tubes. One of the crewmen, realizing that his exposure suit was defective in this regard, donned a life preserver over his exposure suit. He and the captain, whose exposure suit functioned normally, helped the other two men keep their heads out of the water.

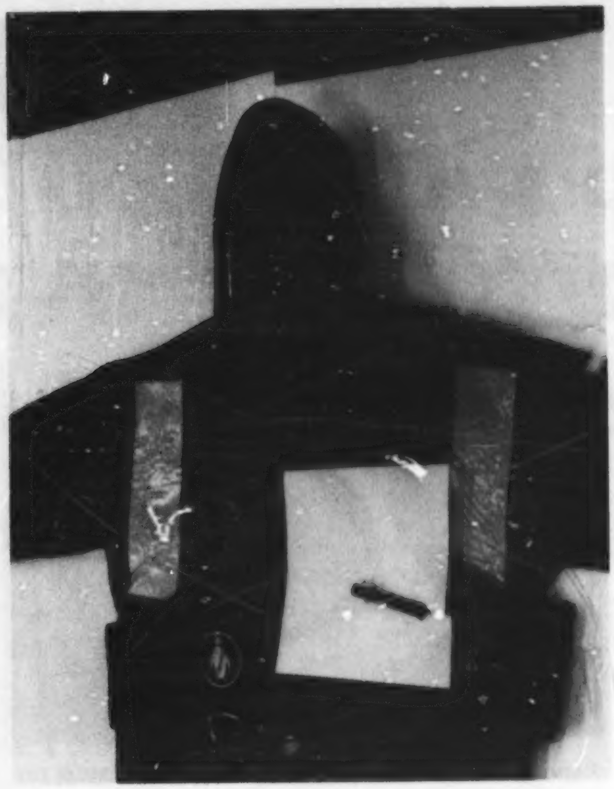
The captain kept encouraging his crew by telling them that the Coast Guard had heard their distress signal and knew where they were. "The helicopters are on the way," he told them. One man was despondent about the loss of his cousin who had been in the liferaft. His exposure suit also shipped some water. As this man became more and more affected by the 40-degree water, he started to talk incoherently and eventually lost consciousness and died.

Unknown to the men in the water, the Coast Guard rescue aircraft were forced to abort their missions because of severely deteriorating weather conditions. A number of Coast Guard, Navy, and commercial fishing vessels searched for over 11 hours before the survivors were recovered. During the night and before the crewman died from exposure, the men in the water saw searchlights from rescue craft passing over them, but they were not seen until the rescuers were nearby.

The owner did not equip the exposure suits and life preservers with the lights required by Title 46 Code of Federal Regulations 25.25-13. This regulation only applies to uninspected vessels on ocean, coastwise, or Great Lakes voyages. This vessel had been boarded before by the Coast Guard, and the lack of lights was not mentioned to the captain since his vessel was boarded in inland waters where this regulation does not apply. If the suits had been equipped with lights, the survivors might have been located and rescued before the second death occurred. In this connection, the National Transportation Safety Board, in its report entitled "Sinking of the United States Fishing Vessel ATLANTIC MIST, January 31, 1985, about 15 nmi East of Chincoteague Island, Virginia," made the following recommendation to the Coast Guard:

> *Require U.S. Coast Guard boarding personnel to notify masters and owners of noncomplying uninspected commercial fishing vessels, known to operate in coastwise, ocean, or Great Lakes waters, in writing of the regulation requiring these vessels, when operating in such areas, to equip life preservers and exposure suits substituted for life preservers with lights even if the vessel is boarded in waters in which the regulation does not apply.*

(This quote was taken from the National Transportation Safety Board's Report Number NTSB / MAR-85 / 03 / SUM, "Sinking of the United States Fishing Vessel ATLANTIC MIST, January 31, 1985, about 15 nmi East of Chincoteague Island, Virginia," published by NTSB, Washington, DC, 1985.)



Exposure suit used on the F/V ATLANTIC MIST. Note the missing inflator tube that is required to inflate the auxiliary means of buoyancy. (Photo by the author)

Lessons Learned

Several lessons can be learned from this tragedy. First, this casualty was caused by the failure of the vessel's crew to properly secure the watertight closures for the deck openings leading to the clam hold. Inflator tubes on exposure suits that are equipped with an auxiliary means of buoyancy should have clamps to hold the tube firmly in place. Owners of exposure suits that lack clamps should contact the manufacturer or supplier for assistance in obtaining them. The failure to provide lights for the exposure suits and life preservers may have contributed to the loss of one life. Owners of exposure suits and life preservers that do not have lights are encouraged to provide them, even if the vessel is used in water where the lights are not required. A regulatory project will be initiated by the Coast Guard to require that exposure suits on ocean, coastwise, or Great Lakes vessels be equipped with lights whether or not the exposure suits are carried as additional equipment (the current regulations in 46 CFR 25 do not require lights on exposure suits unless the exposure suits are carried in lieu of life preservers.)

Several positive lessons came out of this casualty. First, the captain knew his vessel's location and reported his problem and location immediately even though he initially thought he was in no danger. The vessel was equipped with exposure suits and a liferaft. The captain organized his crew and had them don exposure suits immediately. If the captain had not taken these precautions, the loss of life probably would have been greater.

The Coast Guard's Fishing Vessel Safety Task Force

As the sinking of the ATLANTIC MIST illustrates, commercial fishing is dangerous. In fact, the fishing industry has the worst safety record of any marine, industrial, or commercial activity in this country. In response to the poor safety record of uninspected commercial fishing vessels, the Commandant of the Coast Guard recommended a Fishing Vessel Safety Initiative to the Secretary of Transportation to reduce the number of casualties. The program was approved by the Secretary and is now a major safety initiative of the Coast Guard and Department of Transportation.

To develop the initiative, the Commandant formed a Fishing Vessel Safety Task Force. After visits to a number of port areas and soliciting advice and recommendations from industry representatives, government agencies and other Coast Guard personnel, it was determined that a voluntary program dealing with vessel standards and crew safety awareness and education was needed and could be effective in improving safety.

The vessel standards program originally consisted of a series of five Navigation and Vessel Inspection Circulars (NVICs), as follows: Stability (5-85), Radio and Shipboard Navigation Equipment (6-85), Fire Safety Measures (7-85), Lifesaving Equipment and Protection of the Crew (8-85), and Hull, Machinery, and Electrical Installations (9-85). They were published between June and September 1985. All five have been consolidated and published in NVIC 5-86 after allowing time for persons in the fishing industry to review, evaluate, and comment on our proposed safety standards.

To ensure wide circulation of these proposed standards, Task Force personnel distributed them to over 230 individuals, groups, and organizations throughout the United States who have an interest in fishing vessel safety (in addition to those already receiving NVICs through the Government Printing Office). These groups included safety consultants, marine surveyors, naval architects, insurance underwriters, fishing vessel owners' associations, boat builders, fisheries unions, personnel associated with the National Oceanic and Atmospheric Administration Sea Grant program, and the National Marine Fisheries Service. Several sent detailed documents; all expressed a favorable reaction to the standards. Other methods also used to inform Coast Guard personnel and the public about the safety initiatives included Commandant Notice, Commandant's Bulletin, Fish Expo '85, industry-sponsored fishing vessel safety seminars and conferences throughout the country, Federal Register notice, and articles in industry periodicals.

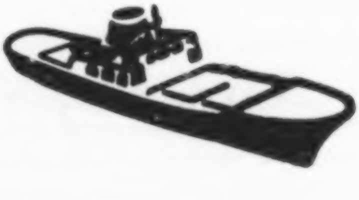
NVIC 5-86 includes recommended voluntary standards intended to be used as guidelines for increased safety on board U.S. uninspected commercial fishing, fish processing, and fish tender vessels. It was assembled using a variety of sources, including feedback received from persons having an interest in fishing vessel safety; from classification society rules; from the Code of Safety for Fishermen and Fishing Vessels prepared by the Food and Agriculture Organization of the United Nations (FAO), the International Labor Organization (ILO), and the International Maritime Organization (IMO); from Canadian and United Kingdom fishing vessel requirements; from the American Boat and Yacht Council's (ABYC) Safety Standards for Small Craft; and from Coast Guard publications, applicable industry standards, and appropriate portions of federal regulations. NVIC 5-86 is one component of an overall safety program aimed at improving the safety record of commercial fishing vessels. The other components are the North Pacific Fishing Vessel Owner's Association/U.S. Coast Guard "Vessel Safety Manual" and industry-sponsored training courses.

The safety awareness and education program was pursued by the Coast Guard in company with the North Pacific Fishing Vessel Owner's Association (NPFVOA). A looseleaf "Vessel Safety Manual" was published with chapters paralleling the vessel standards. Whereas NVIC 5-86 focuses on the technical aspects of fishing vessel design, construction, and equipment, the "Vessel Safety Manual" is specifically tailored for fishermen and addresses general operational concerns common to all commercial fishing vessels in different fisheries nationwide. It is easy to read and is illustrated with pictures and diagrams to facilitate teaching and learning. Fishing vessel owners, operators, and masters will find that the principles presented in the manual can be adopted to establish safety practices aboard their vessels. Associations and other interested groups may wish to add to this manual especially if a specific fishery has safety concerns unique to what now exists in the manual. Persons interested in purchasing a copy of the guide may do so by writing to NPFVOA Safety Program Office, Suite 207, Building C3, Fishermen's Terminal, Seattle, WA 98119; telephone (206) 283-0861. Those wishing to supplement the "Vessel Safety Manual" by developing specific local safety recommendations should contact Commandant (G-MTH-F/V), 2100 Second Street, SW, Washington, DC 20593. Printing plates for the "Vessel Safety Manual" can be made available for such purposes.

The "Vessel Safety Manual," in combination with the voluntary vessel standards contained in NVIC 5-86, gives persons in the fishing industry the framework necessary to develop and implement safety programs on their own. These voluntary vessel standards, coupled with the NPFVOA/USCG "Vessel Safety Manual" and private industry training courses, provides the commercial fishing industry with an overall fishing vessel safety enhancement program that will significantly improve its safety record by preventing casualties such as the sinking of the ATLANTIC MIST.

The Coast Guard recommends that vessel builders, marine surveyors, insurance underwriters, fishing vessel owners, operators, industry associations, and other interested parties (1) adopt and implement the voluntary vessel standards contained in NVIC 5-86, (2) develop regional specific safety recommendations and incorporate them into the NPFVOA/USCG "Vessel Safety Manual," and (3) develop and implement regional training programs using the NPFVOA/USCG "Vessel Safety Manual" as input into a curriculum outline and reference text.

Further information on fishing vessel safety and exposure suits can be found in the following articles published recently in this magazine: "Fishing Vessel Safety," June 1985, p. 137; "Exposure Suits," September 1985, p. 187; "The 'Penguin' and 'Susie' Saved My Life," February 1986, p. 31. ⬇



From the Editor

Dear Readers:

I'd like to thank all of you who promptly mailed in the subscription renewal postcards from the August 1986 issue of **Proceedings.** The heavy response indicates a genuine interest in the maritime safety issues that **Proceedings** tries to publicize each month. On behalf of the **Proceedings'** authors — individuals who contribute their time and talent to inform the maritime public — thanks for your interest and support.

Now for the bad news. It seems we have encountered a few unforeseen problems with the update of our mailing list. We've gotten a number of cards with handwritten messages asking us to delete four or five subscribers from the list — but to add another ten names. Some of you have asked not only to continue your subscription, but also to receive additional copies each month. And a few of you (only a few, thank goodness) mailed your cards to us, but you forgot to attach your mailing label, so we can't track your name and address to continue your subscription.

Because this magazine is published by a very small staff, and because updating the mailing list is basically a manual process, some of your requests may be accidentally overlooked. Please be patient with us. Presumably, we will complete our update by the first of the year. When the last of the renewal cards has been processed, I will publish a notice in **Proceedings** to let you know that the updated list has taken effect.

If you continue to have a subscription problem after the updated list is completed, please contact me at the address below and tell me what the problem is. We will do our best to resolve your problem as quickly as possible.

And thanks again.

Editor, **Proceedings** Magazine
U.S. Coast Guard (G-CMC/21)
2100 Second Street, SW
Washington, DC 20593

Sharon Chapman

LOAD LINES

continued from page 227

Future Shipping Trends Affecting the Caribbean Trade

As fleets of the major world nations age and the world economy tightens, less money will likely be available for ship repair and maintenance. As a result, more foreign-flag vessels will be changing to operation in more temperate zones. It is safe to conclude that many of these vessels will end up in the Caribbean trade. This will require greater vigilance for the Coast Guard in the performance of its load line oversight functions. ⚓

Marine Safety Center Telephone Numbers

In the May 1986 issue of **Proceedings,** we featured an article about the Coast Guard's Marine Safety Center (by LCDR John E. Veentjer, p. 95). The Marine Safety Center was established to consolidate many of the Coast Guard's activities in the Commercial Vessel Safety Program.

At the time LCDR Veentjer's article was published, the Marine Safety Center was in the process of moving into new office space. To avoid confusion for **Proceedings** readers, we decided to publish the Center's address and telephone numbers **after** the move was accomplished. After a brief delay due to telephone installation, the Center is now operational.

Telephone numbers for the Center's various divisions are listed below:

Commanding Officer — (202) 267-0795

Hull Division — (202) 267-1881

Engineering Division — (202) 267-0577

Cargo Division — (202) 267-0509

The Marine Safety Center also may be reached by writing to U.S. Coast Guard (G-MSC), 2100 Second Street, SW, Washington, DC 20593. ⚓

Henry E. Collins Awarded Coast Guard Meritorious Public Service Award

On July 31, 1986, U.S. Coast Guard Commandant Admiral Paul A. Yost awarded Henry E. Collins, Vice President for Governmental Affairs, Underwriters' Laboratories, Inc., the Coast Guard Meritorious Public Service Award, the highest recognition of its kind the Coast Guard may award to a private individual.

Mr. Collins was cited for distinguished public service in supporting U.S. Coast Guard safety programs for the past 25 years, and assisting the Coast Guard in adopting numerous industry standards for equipment and materials, as well as new approval procedures to benefit the government, the industry, and the public.

Mr. Collins has made valuable contributions toward a successful and timely transition from an era of Coast Guard approvals based upon intensive in-house review, testing and plant inspection, to an era of approvals based upon industry consensus standards and independent laboratory certification. These initiatives allowed the Coast Guard to concentrate valuable resources on other important program areas, while maintaining an excellent level of safety.

The award was presented to Mr. Collins by RADM J.W. Kime, Chief of the Coast Guard's Office of Marine Safety, Security and Environmental Protection, at Mr. Collins' retirement ceremony, held at the U.S. Chamber of Commerce.

The Coast Guard has had a long history of working with voluntary standards organizations to develop industry standards for vessel design, marine systems, equipment, and components which can be adopted. The regulations for commercial vessels and recreational boats adopt a large number of industry standards, thus avoiding thousands of pages of regulations. Coast Guard regulatory policy requires the use of industry standards and third-party organizations to the maximum extent possible. Currently, over 200 industry standards are adopted. This results in a savings of over 20,000 pages of federal regulations.

Davis: New Merchant Marine Minority

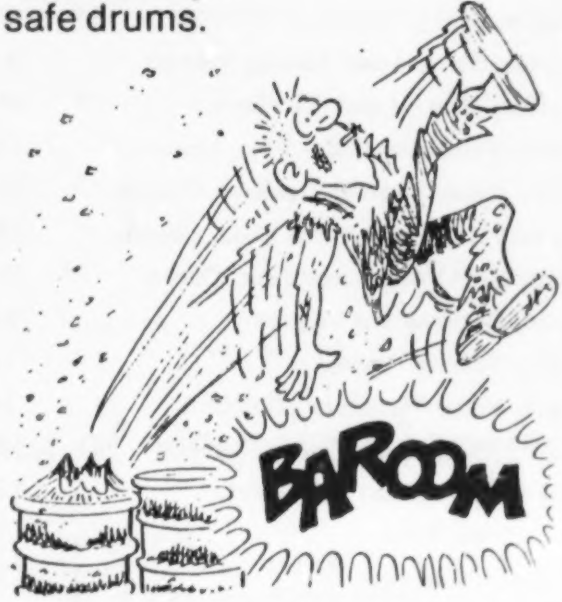
Bob Davis (R-MI) has assumed the duties of the Ranking Minority Member of the House Merchant Marine and Fisheries Committee.

Congressman Davis was elected to the post by the House Republican Conference July 17, 1986, to fill the vacancy left by Norm Lent (R-NY) who moved to an identical slot at the House Energy and Commerce Committee. Congressman Lent replaced Jim Broyhill (D-NC) who was appointed to the U.S. Senate to fill the unexpired term of Senator John East, who died in early July.

"This is a great honor and a great challenge. I am pleased to be in a position of great influence on a Committee that has so much direct impact on Northern Michigan," said Congressman Davis, a Member of the Committee since coming to Congress in 1979.

In addition to retaining his position as Ranking Minority Member of the Coast Guard and Navigation Subcommittee, Congressman Davis also becomes an ex-officio Member of five other Subcommittees. Congressman Lent loses his ex-officio status on the Subcommittees but assumes Mr. Davis' membership on the Merchant Marine and Panama Canal/Outer Continental Shelf Subcommittees.

Empty drums
aren't always
safe drums.



- Don't smoke in areas where chemicals are used or stored.

*(From the May 1986 **Safety Bulletin,** used with permission of the Chevron Shipping Co.)*

1985 Merchant Marine Personnel Statistics

Merchant Marine Officer Licenses Issued

Deck

	Issues	Endorsements	Failures	Renewals
Master, Any Gross Tons, Oceans	142	38	13	710
Master, Great Lakes	7	4	0	48
Master, Coastwise	13	3	0	40
Master, Lakes, Bays, Sounds/Rivers	598	300	17	1101
Master, Uninspected Vessels	72	41	0	185
Master, Fishing Vessels	12	7	0	40
Master, Ferry Vessels or MODUs*	64	4	0	34
Master, Freight and Towing Vessels	515	203	15	263
Master, Mineral and Oil Vessels	407	156	4	297
Chief Mate, Any Gross Tons, Oceans	171	65	4	160
Chief Mate, Limited Tonnage, Oceans	239	76	6	172
Second Mate, Any Gross Tons, Oceans	186	34	9	226
Third Mate, Any Gross Tons, Ocean	334	18	8	336
Mate, Uninspected Vessels	22	13	1	34
Mate, Fishing Vessels	12	1	0	37
Mate, Ferry Vessels or MODUs	14	1	0	3
Mate, Freight and Towing Vessels	168	44	8	40
Mate, Mineral and Oil Vessels	152	19	5	22
First Class Pilot	179	505	7	1180
Second Class Pilot	0	0	0	1
Operator, Uninspected Towing Vessels	509	135	23	1907
Second Class Operator, Uninspected Towing Vessels	119	13	8	12

*MODU-Mobile Offshore Drilling Unit

Engineer

	Issues	Endorsements	Failures	Renewals
Chief Engineer, Motor	104	143	5	226
First Assistant, Motor	89	105	2	119
Second Assistant, Motor	134	82	2	102
Third Assistant, Motor	230	25	3	596
Chief Engineer, Steam	108	14	7	559
First Assistant, Steam	178	8	5	253
Second Assistant, Steam	110	13	4	457
Third Assistant, Steam	160	4	2	217
Chief, Engineer, Steam & Motor	15	14	0	236
First Assistant, Steam & Motor	14	9	0	52
Second Assistant, Steam & Motor	47	13	1	70
Third Assistant, Steam & Motor	403	6	1	595
Chief Engineer, Uninspected Vessels	168	48	3	191
Assistant Engineer, Uninspected Vessels	75	9	5	84
Chief Engineer, Fishing Vessels	5	3	0	35
Assistant Engineer, Fishing Vessels	1	0	1	7
Chief Engineer, Ferry Vessels or MODUs	28	2	0	39
Assistant Engineer, Ferry Vessels or MODUs	5	1	0	2
Chief Engineer, Mineral & Oil Vessels	248	65	1	129
Assistant Engineer, Mineral & Oil Vessels	29	4	0	2

Staff Officer Certificates of Registry Issued

Surgeon	3	Purser/HM	0
Professional Nurse	3	Senior Assistant Purser	0
Chief Purser	11	Senior Assistant Purser/PYA	0
Chief Purser/ PYA*	0	Senior Assistant Purser/HM	0
Chief Purser/HM**	1	Junior Assistant Purser	7
Purser	8	Junior Assistant Purser/PYA	0
Purser/PYA	0	Junior Assistant Purser/HM	1

*PYA - Physician's Assistant
**HM - Hospital Corpsman

Operator Licenses

	Issues	Endorsements	Failures	Renewals
Small Passenger Vessels (Ocean)	3292	761	87	2415
Small Passenger Vessels (Inland)	1879	174	121	895
Uninspected Passenger Vessels	2887	143	145	1471

Radio Officer License

	Issues	Endorsements	Failures	Renewals
Radio Officer	16	5	n/a	241

Summary of All License Transactions

	Issues	Endorsements	Failures	Renewals
Deck (Less OUTV & 2/C OUTV*)	3306	1532	97	4929
OUTV & 2/C OUTV	628	148	31	1865
Engineer	2151	568	42	3971
Staff Officer	34	n/a	n/a	n/a
Operator (SPV & UPV**)	8058	1078	353	4781
Radio Officer	16	5	n/a	241
Radar Observer	n/a	8291	n/a	n/a
TOTALS	14,193	11,622	523	15,787

TOTAL ALL TRANSACTIONS 42,125

*OUTV & 2/C OUTV - Operator, Uninspected Towing Vessels and Second Class Operator, Uninspecte Towing Vessels

**SPV & UPV - Small Passenger Vessels and Uninspected Passenger Vessels

Comparison

	1982	1983	1984	1985
Licenses Issued/Renewed	24,499	32,337	25,314	29,980
Endorsements	2,826	2,767	2,589	3,331
Failures	5,819	9,980	6,981	523
Radar Observer	1,510	3,552	3,064	8,291
TOTAL TRANSACTIONS	34,654	48,636	37,948	42,125

Original Merchant Mariners Document Issued

Yearly	Atlantic Coast	Pacific Coast	Gulf Coast	Great Lakes Region	Total
January 1985	155	200	520	10	885
February 1985	85	202	271	7	565
March 1985	90	168	323	14	595
April 1985	211	214	268	11	704
May 1985	355	148	285	13	801
June 1985	503	218	275	13	1,009
July 1985	83	123	324	22	552
August 1985	116	195	215	10	536
September 1985	91	230	290	7	618
October 1985	56	178	21	8	493
November 1985	73	194	231	11	509
December 1985	78	153	209	11	451
TOTAL	1,896	2,223	3,462	137	7,718

Original and Additional Endorsements Issued

	Atlantic Coast	Pacific Coast	Gulf Coast	Great Lakes Region	Total
AB-Any Waters, Unlimited	279	209	540	10	1,038
AB-Any Waters, Limited	261	91	89	6	447
AB-Any Waters, Special	128	41	63	2	234
AB-Great Lakes, 12 Months	3	0	0	1	4
AB-Other	28	14	70	1	113
Lifeboatman	1,039	241	586	37	1,903
Electrician	240	84	187	3	514
Oiler	346	160	39	7	552
Fireman/Watertender	284	110	89	2	485
Other Q.M.E.D. Ratings	1,951	400	55	20	2,426
Tankerman	449	200	175	19	843
Entry Ratings and Steward's Department including Temporary Documents	4,670	6,212	3,435	185	14,502
TOTAL	9,678	7,762	5,328	293	23,061

Membership Invitation

The American Society of Mechanical Engineers (ASME) is seeking members for its Subcommittee on Boiler and Pressure Vessel Accreditation (SC-BPVA). The category of membership desired is that of General Interest which would include the general public, public educators, or consulting engineers. The committee currently is composed of a sufficient number of members representing the other categories, i.e., manufacturers, users, regulatory bodies, and inspection.

The SC-BPVA is responsible for establishing, reviewing, and implementing the activities which are managed and coordinated by ASME pertaining to accreditation programs associated with the Code Symbol Stamps issued by ASME to manufacturers of boilers and pressure vessels. The applicable Code Sections include SC-I for Power Boilers, SC-IV for Heating Boilers, SC-VIII Divisions 1 and 2 for Pressure Vessels, and SC-X for Fiberglass Pressure Vessels. The committee issues, renews, or withdraws the authority to use the Code Symbol Stamps based on quality assurance reviews of manufacturer operations. It also reviews and evaluates reported code deficiencies, nonconformances, or alleged violations reported to the society. The subcommittee is charged with assuring the resolution of such deviations from accepted practices in accordance with prescribed procedures.

Title 46, Code of Federal Regulations, Subchapter F, Marine Engineering, adopts the ASME Code Sections I, IV, and VIII for boilers and pressure vessels that are to be installed on certificated vessels. The Coast Guard is firmly committed to the activities of the Accreditation Subcommittee. The Coast Guard participates actively on this subcommittee and the code committees to assure that equipment built to ASME Codes and installed on board Coast Guard certificated vessels satisfies the requirements of Subchapter F. Participation by the private sector is encouraged.

The ASME committees function best when all categories are represented. Anyone interested in serving in the General Interest category on the ASME Subcommittee on Boiler and Pressure Vessel Accreditation should contact one of the following:

Mr. Charles E. Ford
Chairman, SC-BPVA
Babcock & Wilcox Co.
P.O. Box 351
Barberton, OH 44203
(216) 860-6542

Mr. Alan Bagner
Secretary, SC-BPVA
ASME
United Engineering Center
345 East 47th Street
New York, NY 10017
(212) 705-7646

CDR Paul J. Pluta
U.S. Coast Guard (G-MVI)
2100 Second Street, SW
Washington, DC 20593
(202) 267-1464

⚓

Free Lists of Government Publications

Users of government information can now find out about new publications in their field of interest as soon as they become available. The U.S. Government Printing Office (GPO) offers free Priority Announcement Service describing new books issued by the U.S. Naval Observatory and other federal agencies in the areas of astronomical data and phenomena, aviation, marine navigation, and much more. Annual titles include the **Nautical Almanac, Air Almanac,** and **Astronomical Phenomena.**

This service is being offered to increase public awareness of and access to government information. According to GPO's Public Printer, Ralph E. Kennickell, Jr., "Priority Announcements enable businesses across the nation to keep up with new government publications of interest to them."

To begin receiving free Priority Announcements of new publications on astronomy, aviation, and marine navigation, please write to the Superintendent of Documents, Dept. 36-SM, U.S. Government Printing Office, STOP: SM, Washington, DC 20401, and request to be placed on list N-511. *(Reprinted from the June 1986 issue of **WWS/World Wide Shipping Magazine.**)* ⚓

Retroreflective Material

The Coast Guard recommends that work vests, especially those used on towboats and barges, be equipped with Coast Guard-approved retroreflective material.

Although the term "retroreflective material" may not be familiar to many people, almost everyone sees it and uses it every day. It's just a technical name for those materials that reflect light back in the same direction from which it comes. Highway signs and road markings have been made with retroreflective material for many years so that light from the headlights of oncoming vehicles makes the signs appear brightly lit to the driver. Emergency vehicles, jogging clothes, bicycle tires, and many other items are now marked with retroreflective material to improve traffic safety in darkness.

On the marine side, dayboards, buoy markings, and other aids to navigation are marked with retroreflective material to improve their nighttime visibility. Since 1980, life preservers on commercial vessels have been marked with retroreflective material to make them more visible at night. Soon, almost all floating marine survival equipment for commercial vessels will be manufactured with retroreflective material already applied.

Work vests are not life preservers and are not included in the requirements to have retroreflective material. Work vests are intended to provide some basic flotation without being too cumbersome to work in, as a life preserver might be. Consequently, work vests do not have the same amount and arrangement of buoyancy as a life preserver and will not turn most people face-up automatically. Therefore, if someone wearing a work vest is injured in a fall overboard and is rendered unconscious or helpless, it is important to rescue the victim quickly. If the accident occurs at night, retroreflective material on the work vest would help locate a victim more quickly if rescuers used a searchlight, or even a good flashlight.

Although regulations do not presently require it, the Coast Guard recommends that work vests, especially those used on towboats and barges, be equipped with Coast Guard-approved retroreflective material. The Coast Guard-approved material is very bright and is made so that it does not lose its retroreflectivity when wet. Several distributors make retroreflective material kits that include precut material, adhesive, and instructions. These are generally available from marine suppliers.

A number of recent casualties indicate that retroreflective material on work vests might have saved the lives of crew members who fell overboard from barges. Here is a summary of a number of these accidents:

1. Just before sunrise, a deckhand fell overboard from a tow operating in a sound. He apparently tripped and was not seen or heard as he fell. The deckhand was wearing a work vest, and before he fell, he was working on one of the barges in an area illuminated by floodlights from the towboat. The deckhand was missed shortly after he went overboard, and a search began, first on the barges and the towboat, and then in the water using searchlights. Eventually, another towboat and Coast Guard boats and helicopters joined the search. The deckhand's body was found by a Coast Guard boat about 8 hours later, 3 miles from the point where he fell overboard, still wearing the work vest. His death was attributed to immersion hypothermia. If his work vest had been equipped with retroreflective material, he might have been seen falling since he was in an area illuminated from the bridge. He also would have been able to be spotted quickly by rescuers once the search in the water began.

2. In the early morning hours, while it was still dark, a deckhand fell into a darkened space between a barge and the bow of the towboat. The tow was against a riverbank and not underway at the time of the accident. Another crew member heard the splash, and a search got underway immediately. The deckhand was found about 15 minutes later about 800 feet downriver. Had his work vest been equipped with retroreflective material, he might have been found sooner and possibly saved.

3. About 10:30 p.m., a deckhand disappeared from a barge that was part of a tow stopped in

a river to remove and rearrange some barges. He was not seen or heard going overboard, but a search of the towboat and barges began as soon as the deckhands he was working with noticed that he was missing. When he was not found on board, the towboat's yawl was launched to search the river. The deckhand was found drowned soon afterward, still wearing his work vest. If the work vest had been equipped with retroreflective material, a quick sweep of the water with a searchlight might well have located the deckhand as soon as the search began. The time saved in locating him might have enabled him to survive.

4. In the early evening darkness, a deckhand was working alone at the head of a tow, trying to drop a line onto a moored barge. The pilot lost sight of the deckhand behind the covers of the lead barge, and he commenced a search about 3 minutes later after the deckhand did not reappear. When the deckhand could not be found, the Coast Guard and state police were called in to help search. The deckhand was found drowned, still wearing his work vest, about an hour and a half later. If his work vest had been equipped with retroreflective material, he possibly could have been found much sooner and might have survived.

These cases all involved deaths that might have been prevented if work vests had been equipped with retroreflective material. There are other nighttime cases like these in Coast Guard casualty files that don't include enough detail to be included in this article, but certainly a number of them are similar. There are probably many other cases where there have been only minor injuries, or where a lot of time was spent looking for someone who had fallen overboard in the darkenss. A few dollars invested in retroreflective material might have saved hundreds or even thousands of dollars in lost time and prevented needless deaths.

U.S. Naval Institute and Eastman Kodak Announce the 25th Annual Naval and Maritime Photo Contest

The Government Systems Division of the Eastman Kodak Company has joined the U.S. Naval Institute as a sponsor of the Institute's annual naval and maritime photo contest.

Because of Kodak's co-sponsorship, the Institute will be awarding more cash prizes than ever before. First prize will be $500, second prize will be $350, and third prize will be $250. Fifteen honorable mentions will be selected and awarded $100 each.

Photo entries are due on December 31, 1986. All photos must pertain to a naval or maritime subject.

Winning photos are published each year in the monthly professional magazine of the Naval Institute, **Proceedings.**

The official entry rules for the contest are as follows:

1. Each photograph must pertain to a naval or maritime subject. (The photo is not limited to the calendar year of the contest.)
2. Limit: 5 entries per person.
3. Entries must be either black and white prints, color prints, or color transparencies.
4. Minimum print size is 5 x 7.
5. Minimum transparency size is 35 mm. (No glass mounted transparencies, please.)
6. Full captions and the photographer's name and address must be printed or typed on a separate sheet of paper and attached to the back of each print, or printed on the transparency mount. (No staples, please.)
7. Entries must arrive at the U.S. Naval Institute no later than December 31, 1986.
8. Anyone is eligible to enter.

Photographs not awarded prizes could be purchased by the Naval Institute. Those photos not purchased will be returned to the owner if accompanied by a stamped, self-addressed envelope.

For additional information or a list of contest rules, contact the Membership Department, U.S. Naval Institute, Annapolis, MD 21402, or call 1-800-233-USNI.

Marine Safety Manual, Volume VI, Now Available

The **Marine Safety Manual (MSM)** is a 10-volume publication which provides information and guidance to Coast Guard personnel assigned to marine safety duties. First published in 1978, the MSM is being revised to update the subject matter and to comply with the Coast Guard Directives System. Volumes previously published were Volume IV, "Technical," December 1984; Volume II, "Materiel Inspection," October 1985; Volume III, "Marine Industry Personnel," December 1985; and Volume I, "Administration and Management," June 1986.

Seven of the volumes will be available to the general public when revision has been finalized:

Volume No.	Title	COMDTINST No.
I	Administration and Management	M16000.6
II	Materiel Inspection	M16000.7
III	Marine Industry Personnel	M16000.8
IV	Technical	M16000.9
V	Investigations	M16000.10
VI	Ports and Waterways Activities	M16000.11
IX	Vessel Documentation	M16000.14

The fifth of the revised **MSM** volumes, Volume VI, "Ports and Waterways Activities," is now available from the U.S. Government Printing Office (GPO). For your convenience, we are including a GPO order form for this publication.

Volume VI presents the authority, background, and rationale for the various programs associated with port and environmental safety (PES) duties and prescribes essential functions which must be performed in order to attain the overall PES objectives of the Coast Guard.

Similar notifications will be provided in the **Proceedings** when the remaining **MSM** volumes are published.

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Marine Safety Council Membership

Rear Admiral
Martin H. Daniell, Jr.

Rear Admiral Martin H. Daniell, Jr., became Chief of the Office of Navigation at U.S. Coast Guard Headquarters in June 1986. As Chief, he is responsible for Coast Guard operations involving short-range aids to navigation, radionavigation aids, navigation systems safety, and bridge administration. RADM Daniell will also serve as a Member of the Marine Safety Council. He was assigned to Headquarters in 1983 and has since served as Chief, Operational Law Enforcement Division; Deputy Chief, Office of Operations; and Deputy Chief of Staff.

He commanded the Coast Guard Cutter MELLON, homeported in Seattle, from 1981 to 1983. He was Commanding Officer of Group and Base Mobile, Alabama, from 1978 to 1981. As such, he had operational control of ships and stations from Gulfport, Mississippi, to Appalachicola, Florida, and inland along the navigable waters of Alabama and western Florida. He commanded the cutter YOCONA in Astoria, Oregon, from 1976 to 1977. From 1972 to 1976 RADM Daniell was Assistant Chief, Enlisted Personnel Division, at Headquarters. He was Commanding Officer of the cutter BITTERSWEET in Ketchikan, Alaska, from 1969 to 1972. Responsibilities onboard the cutters included Alaskan fisheries patrols, aids to navigation, search and rescue, and environmental protection.

RADM Daniell's early assignments included command of the cutter CAPE HORN, homeported in Provincetown, Massachusetts; Executive Officer of the cutter BLACKTHORN in Mobile, Alabama; and First Lieutenant onboard the cutter WINNEBAGO in Hawaii.

He was graduated *cum laude* from Dartmouth College, Hanover, New Hampshire, with a Bachelor of Arts degree in economics in 1957. RADM Daniell received a Master of Science degree in management from U.S. Naval Post Graduate School in Monterey, California, in 1966. He was assigned to the U.S. Coast Guard Academy in New London, Connecticut, as an assistant professor of economics and management from 1966 to 1969. He also attended the Industrial College of the Armed Forces at the National Defense University, Washington, from 1977 to 1978.

RADM Daniell's awards include the Meritorious Service Medal with gold star, and three Coast Guard Commendation Medals with "O" device.

A Woodbridge, Connecticut, native, RADM Daniell is married to the former Carolyn Betancourt of Mobile, Alabama. They have three children: Abby, Jennifer and Martin III.

Rear Admiral
Theodore J. Wojnar

Rear Admiral Theodore J. Wojnar, formerly Chief of the Office of Navigation at Coast Guard Headquarters and a member of the Marine Safety Council, is the new Commander of the Thirteenth Coast Guard District.

RADM Wojnar is a native of Holyoke, Massachusetts. He attended the University of Massachusetts for a year while earning an appointment to the Coast Guard Academy as a cadet. After graduation in 1953, he was commissioned in the U.S. Coast Guard and began his career on Artic operations. His first tour of duty was aboard the Boston-based icebreaker, EASTWIND. From there he went to Argentia, Newfoundland, and served with the International Ice Patrol as aerial ice observer and ice patrol duty officer. In 1957 he served on ocean station patrols aboard the cutter CHINCOTEAGUE out of Norfolk, Virginia.

After his Artic tours, he moved to Milwaukee, Wisconsin, to serve as Deputy Group Commander and Industrial Manager of Coast Guard Base Milwaukee. His responsibilities included aids to navigation and search and rescue operations on Lake Michigan. He earned his postgraduate degree in Civil Engineering from Rensselaer Polytechnic Institute in Troy, New York. He was then assigned to Honolulu, Hawaii, as Industrial Manager of Coast Guard Base Sand Island. Next he was named as Assistant Chief of the Civil Engineering Branch for the Fourteenth Coast Guard District as well as LORAN-C Site Survey Officer. He was based in Yokosuka, Japan, for 18 months, heading up a Project Team for the design and construction of the Northwest Pacific LORAN-C chain.

He returned to the U.S. mainland in September 1964 to Coast Guard Training Center Groton, Connecticut, where he served as Public Works Officer and Special Projects Officer. August 1967 saw then-Commander Wojnar assigned to U.S. Coast Guard Activities Europe in London, England, as Chief of the Engineering Division. During this assignment he worked closely with engineers from Iceland, Canada, Denmark, Germany, and Norway on improvements to the European LORAN-C facilities.

In addition to his European and Far Eastern assignments, RADM Wojnar served in the Indian Ocean where he conducted site surveys for the OMEGA Radionavigational Station at La Reunion Island.

In August 1970, he took over management of the Civil and Ocean Engineering support programs for the Third Coast Guard District in New York. In July 1973, he became Assistant Chief of the Civil Engineering Division at Coast Guard Headquarters and was promoted to Chief of the Division in April 1975. During his tour in Washington, DC, he was project officer for the development of the Coast Guard's Shore Facilities Plan and Boat Plan.

RADM Wojnar returned to field operations as the Eleventh District Chief of Operations. In August 1980, then-Captain Wojnar took the post of Chief of Staff in the Fifth Coast Guard District in Portsmouth, Virginia. He served there until July 1983 when he was awarded his third Meritorious Service Medal and was promoted to the rank of Rear Admiral.

Along with his three Meritorious Service Medals, RADM Wojnar has been awarded the Coast Guard Commendation Medal with two gold stars in lieu of second and third awards, the Coast Guard Achievement Medal, the Arctic Service Medal, and the Commandant's Letter of Commendation.

Rear Admiral Wojnar is married to the former Collette V. Mulligan of Westfield, New Jersey. They have four children: Mary-Gayle, Theodore, Jr., Pamela, and Stephen.

Rear Admiral
Peter J. Rots

Rear Admiral Peter J. Rots is the new Commander of the Eighth Coast Guard District. RADM Rots formerly acted as Chief, Office of Marine Environment and Systems, U.S. Coast Guard Headquarters, and was a member of the Marine Safety Council.

RADM Rots was born June 30, 1934 in Pittsburgh, Pennsylvania, and graduated from Dormont High School. He received his Bachelor of Science Degree in Engineering from the Coast Guard Academy in 1957. He also holds a Master's Degree in Industrial Administration from the Krannert School of Business, Purdue University.

During his more than 28 years of Coast Guard service, RADM Rots has had a variety of operational, engineering, and administrative assignments. He earned his aviator's wings in Corpus Christi, Texas, in 1960. From 1965 to 1969, he was the Coast Guard's program manager for the HU-16E Albatross aircraft and the HH-52A helicopters. After a tour from 1970-1975 as the Chief of the Aviation Technical Training Division and later Executive Officer of the Aircraft Repair and Supply Center, Elizabeth City, North Carolina, he was assigned as Commanding Officer, Coast Guard Air Station Detroit.

He was selected to head a study group to establish an Office of Navigation at Coast Guard Headquarters after his graduation from the Industrial College of the Armed Forces in 1979. The office commenced operations in March of 1980, and he was assigned as the first Deputy Office Chief. He then served as Chief of Staff, Fifth Coast Guard District, Portsmouth, Virginia.

On July 1, 1985, he was promoted to the flag rank of Commodore (later Rear Admiral, Lower Half) and was made Chief of the Office of Marine Environment and Systems at Coast Guard Headquarters until his assignment as Commander, Eighth Coast Guard District, in New Orleans.

His many medals and awards include four Meritorious Service Medals with the Operational Distinguishing Device, the Coast Guard Commendation Medal, and the Achievement Medal. During his time in Alaska, he was awarded the Air Medal for the helicopter rescue of 34 stranded miners from an avalanched mine in British Columbia, Canada.

RADM Rots is married to the former Judith Johnson from Pittsburgh, Pennsylvania. They have two children, David and Susan.

Editor's Note: The Office of Marine Environment and Systems and the Office of Merchant Marine Safety merged in mid-1986 to form the new Office of Marine Safety, Security and Environmental Protection, headed by RADM J.W. Kime.

Keynotes

Advance Notice of Proposed Rulemaking

CGD 81-010, Servicing of Inflatable Liferafts (August 14)

The Coast Guard is considering a revision to the regulations governing the servicing of Coast Guard-approved inflatable liferafts used on merchant vessels. Due to an increased emphasis on the use of these devices, changes in the profile of the marine industry, and changes in the technology for constructing these devices, proposed changes to the requirement for periodic servicing are being considered that should decrease the Coast Guard's direct involvement while maintaining a Coast Guard oversight system for quality control. Any rules resulting from this advance notice should allow private industry the flexibility in servicing and inspection of inflatable liferafts necessary to meet the changing needs of the marine industry and minimize the role of U.S. Coast Guard inspectors in the inspection and servicing of inflatable liferafts used on inspected vessels. Comments must be submitted on or before November 12, 1986.

Notice of Proposed Rulemaking (comment period extension)

CGD 84-024, Intervals for Drydocking and Tailshaft Examinations on Inspected Vessels (August 14)

This notice reopened the comment period on the notice of proposed rulemaking concerning the intervals between drydock and tailshaft examinations on all inspected vessels except mobile offshore drilling units (MODUs) inspected under 46 CFR Subchapter I-A and small passenger vessels inspected under 46 CFR Subchapter T. The comment period ended on September 30, 1986.

Notice of Proposed Rulemaking

CGD 84-025, Incinerator Vessels; Safety Rules (August 25)

This notice proposes safety rules for incinerator vessels carrying bulk hazardous wastes for the purpose of incineration at sea. The rules incorporate standards in Chapter 19 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code) of the International Maritime Organization (IMO) as well as standards in existing safety regulations that apply to chemical tank vessels. These rules would apply to vessels required to obtain an ocean incineration permit from the Environmental Protection Agency (EPA). EPA has recently proposed rules for obtaining a permit. Comments must be received on or before October 24, 1986.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 267-1477. The office, Room 2110, is open between the hours of 8:00 a.m. and 3:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

Chemical of the Month

John Plunkett

Camphor Oil

Camphor ($C_{10}H_{16}O$) is a ketone which occurs naturally in the wood of the camphor tree (cinnamonum camphora), an aromatic evergreen indigenous to China and Japan. All of the tree's juices contain camphor. It is a simple process, usually steam distillation, to remove the camphor from the juices. Camphor can also be synthesized by converting pinene into bornyl chloride with HCl, thence to isobornyl acetate, thence to isoborneol, and finally oxidizing borneol to camphor. An alternate route which is being used more frequently for synthesis begins with pinene. Pinene is converted to camphene, which by treatment with acetic acid and nitrobenzene becomes camphor. Though the chief source of natural camphor is Taiwan, the majority of camphor used in the United States is synthesized domestically. Camphor oil is a solution of one part camphor and 4 parts cottonseed oil or olive oil.

Camphor has a variety of uses. It can be used medicinally on the skin as a counter-irritant, anesthethic, and mild antiseptic, and orally as an expectorant and respiratory and circulatory stimulant. It can also be used as a preservative in other drugs. Other uses include it as a plasticizer for cellulose nitrate and other explosives. It is used in insecticide, moth and mildew protectants, and in tooth powder. Currently, the chief use of camphor is as a flavoring material or fragrance.

Though pure camphor exists as a white crystalline solid, camphor oil is usually shipped as an oily liquid in drums. The liquid can be colorless, blue, or brown, and it will usually float on water. Pure camphor will sublime (turn to vapor) at room temperature. Camphor is soluble in alcohol, ethane, chloroform, and fixed oils. Camphor oil gives off a familiar and penetrating odor. It tastes slightly bitter and cooling.

Since camphor oil is

Chemical name:	Camphor oil
Formula:	$C_{10}H_{16}O$
Synonyms:	Gum camphor camphor oil rectified white camphor
Physical Properties:	
boiling point:	sublimes
freezing point:	178.8°C (354°F)
vapor pressure:	
0°C (32°F)	53.559 mmHg
180°C (356°F)	8.799 mmHg
Threshold Limit Values (TLV)	
time-weighted average:	2 ppm
short-term exposure limit:	3 ppm
Flammability Limits in Air	
lower flammability limit:	0.6%
upper flammability limit:	3.5%
Combustion Properties	
flash point (cc):	65.5°C (150°F)
autoignition temperature:	466°C (871°F)
Densities	
liquid (water=1):	0.98
vapor (air=1):	5.3
U.N. Number:	1130
CHRIS Code:	CPO
Cargo compatibility group:	11 (Ketones)

John Plunkett was a Second-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

classified as a flammable liquid by the United States Coast Guard, the Department of Transportation, and the Environmental Protection Agency, all open flames should be kept away from it while it is being stored and transported. Camphor oil will evolve flammable and explosive vapor when heated. Exact specifications for the Coast Guard regulations concerning camphor oil can be found in Part 150 of Title 46, CFR. Environmental Protection Agnecy regulations can be found in Title 40, CFR, and the Department of Transportation regulations can be found in Part 172 of Title 49, CFR.

Undiluted camphor oil has been observed to be a minor irritant to the skin after prolonged exposure; orally, it is toxic in large doses. If irritation of the skin occurs, rinsing with soap and water will speed relief. Within 5 to 90 minutes, the following symptoms may be noted in a person who has ingested camphor oil: nausea, vertigo, headache, skin warmth, irritability, and convulsions. In case of oral intoxication, administer gastric lavage, cathartics, diuretics, or sedatives. Do not use opiates or analeptics (drugs that stimulate the central nervous system).

Persons handling camphor oil should follow the procedures cited in the Code of Federal Regulations as well as those cited in Volume 1 of NIOSHA/OSHA Occupational Health Guidelines for Chemical Hazards. This includes a breathing device to avoid the vapor as well as rubber gloves, eye protection, and a protective suit. ⚓

NEXT MONTH'S CHEMICAL:

BUTYL ACRYLATE (monomer)

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. An impulse reaction turbine has

A. impulse diaphragms with reaction rotor blading
B. stationary nozzles set in a diaphragm and a rotating wheel containing bucket blades
C. reaction stages followed by velocity-compounded blading
D. velocity-compounded stages followed by reaction blading

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

2. Engine condition is indicated by the color of the exhaust smoke. Blue smoke could be an indication of

A. low compression pressure and low combustion temperature
B. an overloaded engine
C. clogged drain holes in the oil control rings
D. complete combustion

Reference: Maleev, Diesel Engine Operation and Maintenance

3. A bridge gauge is normally used to determine turbine

A. bearing oil clearance
B. diaphragm tip clearance
C. blade axial clearance
D. bearing wear

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

4. Copper tubing is often used in fluid power lines because it

A. has good resistance to high temperature
B. withstands heavy vibration under heavy system loads
C. resists hardening under stress
D. has a high resistance to corrosion

Reference: King, Modern Refrigeration Practice

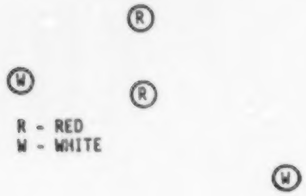
5. Voltage failure of an AC generator may be caused by

A. failure of the exciter generator
B. a tripped bus circuit breaker
C. high mica segments on the stator bus bar
D. excessive prime mover speed

Reference: Hubert, Preventive Maintenance of Electrical Equipment

DECK

1. In international waters, the lights shown below would be displayed by a vessel when it is



A. aground.
B. not under command and is dead in the water.
C. not under command. and is making way.
D. engaged in laying or picking up navigation marks.

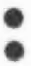
Reference: COMDTINST M16672.2A

2. You are holding position above Gallipolis Lock and Dam when you hear two long blasts of the horn from the lock. This indicates that you should

A. enter the riverward lock.
B. hold position until two more upbound tows have locked through.
C. enter the landward lock.
D. hold position until the lower gates are closed.

Reference: 46 CFR 207.300

3. While on a coastwise voyage in the Aegean Sea, a spar buoy with the top mark illustrated below is sighted. Under the IALA-A Buoyage System, you must



A. pass to the east of the buoy
B. pass to the south of the buoy
C. pass to the north of the buoy
D. pass the buoy on either side but keep well clear

Reference: Light List

4. A loaded hopper barge with independent tanks has a placard, with alternating red and white quadrants on each side and end. Which of the following statements, concerning this barge, is true?

A. The cargo will spontaneously ignite if released to the atmosphere.
B. You must operate this barge as a lead barge.
C. The barge should be spotted as far away from the towboat as possible.
D. The barge must be in a protected position within the tow.

Reference: 46 CFR 151.45-5(b)

5. From LAT 07°12'N, LONG 80°00'W to LAT 47°12'S, LONG 169°18'E, the initial great circle angle course is 137.25°. How would you name this course?

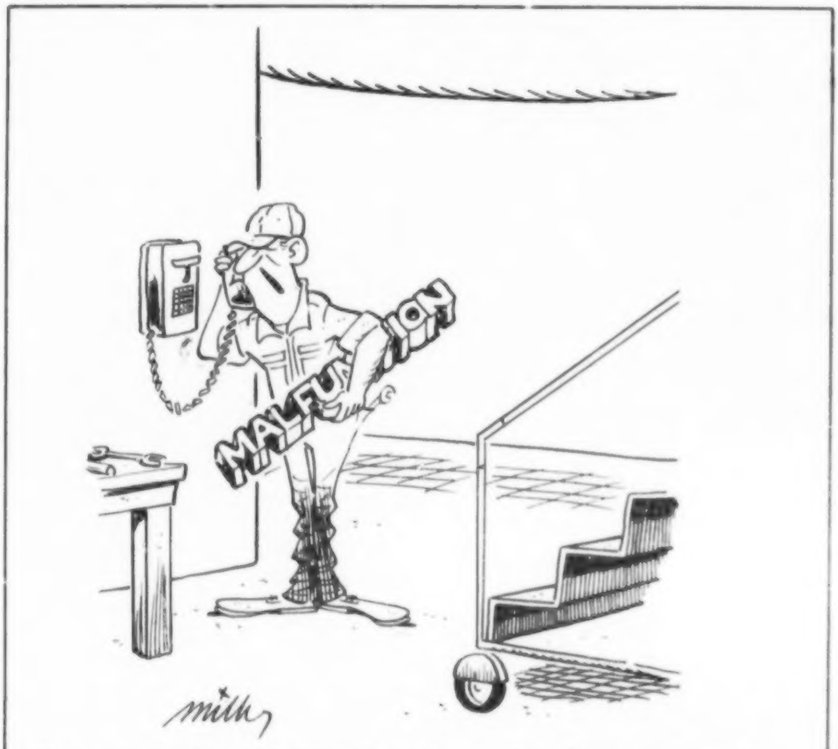
A. N 137.25° E
B. S 137.25° E
C. N 137.25° W
D. S 137.25° W

Reference: Bowditch, American Practical Navigator

ANSWERS

ENGINEER
1-D;2-C;3-D;4-D;5-A
DECK
1-A;2-A;3-D;4-D;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.



"It was something I found in the number three engine."

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Cover

Last winter, the Coast Guard icebreaker POLAR SEA studied ice floes in the Bering Sea. Petty Officer Charles S. Powell photographed this Coast Guard helicopter from the POLAR SEA's deck.

(Official U.S. Coast Guard photo)

The Lift Boat DMC-1

(This article is reprinted from the National Transportation Safety Board's Report No. NTSB/MAR 86/01/SUM, dated June 30, 1986.)

About 0300 on October 16, 1985, the U.S. self-propelled lift boat DMC-1 (see figure 1) departed Port Bolivar, Texas, bound for an offshore job site in High Island Block 139[1] in the Gulf of Mexico, located about 25 nautical miles east-southeast of Galveston, Texas. The DMC-1 was a specialized type of work boat employed in the offshore minerals and oil industry and was fitted with three 114-foot-long jack-up legs which, when lowered to the sea floor, lifted the vessel completely out of the water.

The DMC-1 was equipped with a radar, a long-range navigation (loran)[2] receiver, a fathometer, a gyrocompass, and a magnetic compass. However, only the radar and the magnetic compass were fully operational. The gyrocompass was not operational, the loran receiver would not provide a navigational fix, and the fathometer would give an accurate depth reading only when the vessel was dead in the water. Two 20-man inflatable liferafts also were aboard the DMC-1. Onboard the DMC-1 were a two-man operating crew composed of a master and a deckhand, a cook who was employed by a catering company, and an eight-man crew of industrial workers who had no duties involving the operation of the vessel. The industrial workers had been contracted to perform pile driving operations at the offshore job site.

As the vessel proceeded into the Gulf of Mexico, the industrial workers and the cook were in their quarters asleep while the master and the deckhand were on duty in the pilothouse. The master was at the helm controlling the vessel's movements, and the deckhand stood by to perform duties as directed by the master and to make periodic, routine examinations of the engineroom.

About 0830, the master of the DMC-1 radioed the operator of a passing tug to ask for a position fix. Based on the tug operator's information that the DMC-1 was located in High Island Block 144, the master of the DMC-1 placed the vessel on compass course toward the job site in High Island Block 139.

Shortly afterward, the master ordered the deckhand to conduct a routine examination of the engineroom. When the deckhand arrived at the engineroom, he discovered that a radiator hose to the starboard main engine had split open and that engine cooling water was spilling into the engineroom bilge. The deckhand immediately returned to the pilothouse and reported the condition to the master. The master then ordered the deckhand to return to the engineroom and to insert a garden hose into the radiator of the starboard main engine in order to replace the water flowing from the split radiator hose. The deckhand complied with the order, but the split in the hose enlarged. The starboard main engine began to overheat, and the deckhand returned to the pilothuse to update the master concerning the engine problem. The master then went to the engineroom with the deckhand to evaluate the situation.

The master stated that the cooling system for the starboard main engine was connected to the cooling system for the port main engine by a crossover pipe. To prevent the split radiator hose on the starboard main engine from causing both main engines to overheat, the master closed the isolation valves in the crossover

---

[1] The portion of the Gulf of Mexico which is adjacent to the U.S. coast has been divided into offshore mineral leasing areas for the development of offshore minerals and petroleum resources. These areas are further subdivided into sequentially numbered blocks. The offshore mineral leasing areas and blocks are printed on certain charts of the Gulf of Mexico and are used as reference points by some vessel operators.

[2] Loran is an electronic system using shore-based radio transmitters and shipboard receivers to allow mariners to determine their positions at sea.

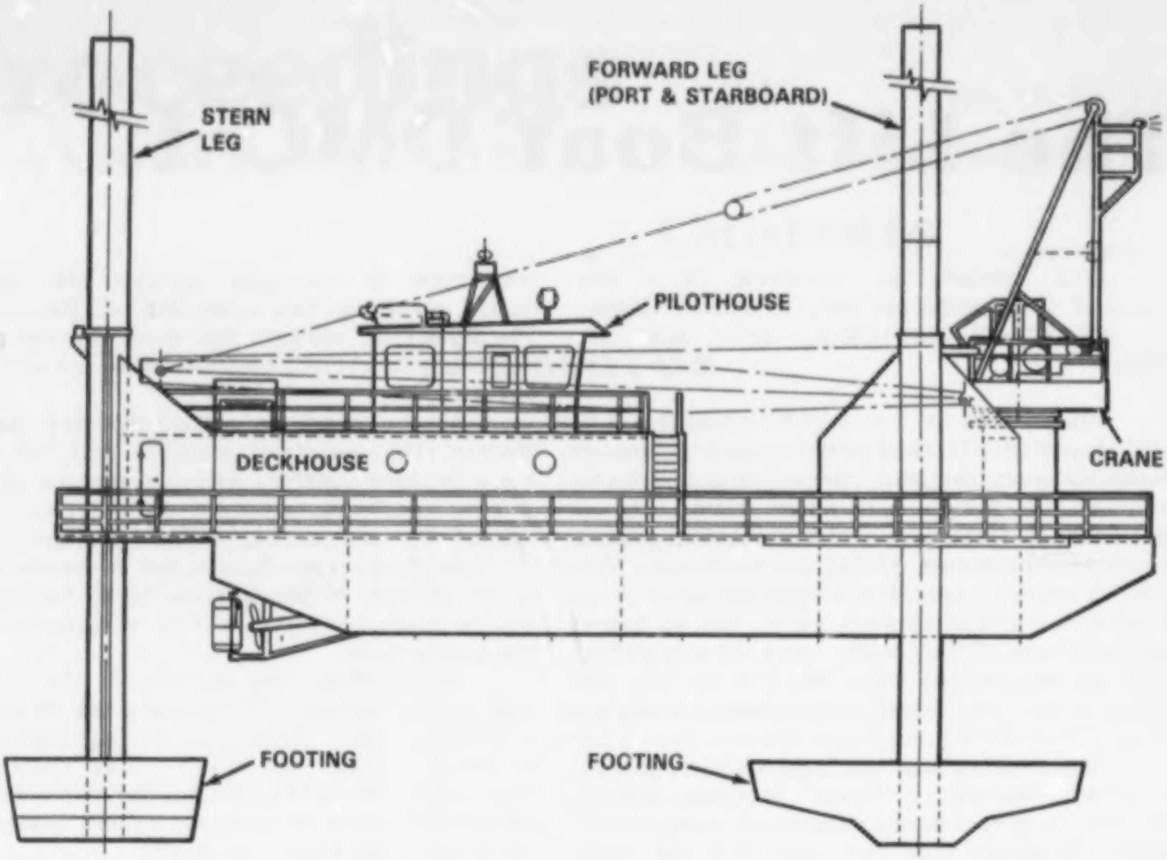


Figure 1.--Outboard Profile of the DMC-1.

pipe. However, the flow of water from the split radiator hose did not stop, and the port main engine also began to overheat. The master ordered the deckhand to stop the starboard main engine and to reduce the speed of the port main engine. The master said that he intended to jack the vessel out of the water using the port main engine and then stop the port main engine so that repairs to the starboard main engine radiator hose could be made wihout the vessel being adrift. He stated that the vessel was close to the main shipping lanes and that he did not want to vessel to drift in this area for fear that it might result in a collision. He further stated that he could not have anchored because there was no cable attached to the anchor.

About 0840, the master returned to the pilothouse where the leg jacking controls were located. He said that he looked at the navigation chart, saw that the charted water depth in the area was 53 feet, immediately engaged the leg jacking system, and began lowering all three legs at the same time. The master said he did not attempt to obtain a depth reading with the fathometer before he engaged the leg jacking system. While the port main engine was being utilized to operate the leg jacking system, no motive power was being applied to the vessel's propellers, and the vessel drifted toward the northwest under the influence of the 10- to 15-knot southeasterly wind and the 2- to 4-foot southeasterly seas. The master estimated that the DMC-1 drifted at a speed of about 2 to 3 knots.

The master stated that when he began jacking the legs, he was alone in the pilothouse. He said that he had been operating the leg jacking system for 7 to 10 minutes and had lowered the legs about 35 to 40 feet when the vessel took an "immediate jump" and capsized to starboard. He said that there was no forewarning, that there had been no progressively worsening list, and that it was a sudden, unexpected "flip over." The master stated that the vessel capsized before the hull had begun to rise and that the legs had not yet contacted the sea floor.

When the vessel capsized, all of the pilothouse windows broke, and the pilothouse filled with water. The master stated that he did not have time to activate the general alarm. When the pilothouse was completely submerged so that pressure on both sides of the port side pilothouse door equalized, the master opened the door and swam to one of the inflatable liferafts from the DMC-1 that was floating in the water uninflated. The master pulled the cord (sea painter) to inflate the raft and then climbed aboard it.

Sometime before the master had commenced leg jacking operations, some industrial workers and the cook had awakened and left their sleeping quarters. Two industrial workers were outside on deck while another industrial worker, a pile driver hammer operator, was in the galley talking with the cook who was preparing breakfast. Four welders and an assistant hammer operator were still asleep in their quarters.

The hammer operator said that about 0850 he felt the main engines slow down and the leg jacking system engage. He thought the vessel had arrived at the work site. Despite the master's statement to the contrary, the hammer operator said that, while the legs were jacking down, the vessel began to list to starboard. He left the galley, went on deck where everything looked "okay," and then returned to the galley to resume his conversation with the cook. Four to five minutes later, the hammer operator looked at his wristwatch and noted that the time was 0900. He said that moments later the vessel "leaned to starboard real bad," and that he ran out of the galley to the open deck as the vessel capsized. He went to the port side where he encountered one of the other industrial workers who was holding a ring life buoy which had a line attached to it. The industrial worker threw the life buoy into the water and handed the line to the hammer operator. The hammer operator jumped into the water and, using the line, pulled the life buoy to him.

Two welders awoke in their quarters on the starboard side of the deckhouse as the vessel capsized, and they were suddenly submerged as the deckhouse rapidly filled with water. They swam upward and surfaced in an air pocket in a two-man room on the port side of the deckhouse where they were joined by the cook. The three men escaped from the sinking vessel by breaking the glass of a porthole and swimming through it to the surface, where they joined the master in the inflatable raft.

The DMC-1's other liferaft inflated automatically near the vessel's bow, and the deckhand and two industrial workers were able to board the raft. Two other industrial workers, one (the hammer operator) supported by a ring life buoy and the other supported by a piece of flotsam, were not able to reach the rafts. Two welders were not able to escape from the sinking vessel and were drowned. About 0930, the offshore supply vessel PATRICIA M, which happened to be in the area, arrived on scene and rescued all of the survivors.

In November 1985, the DMC-1 was salvaged from the bottom of the Gulf of Mexico. The wreck was found in a capsized position with the leg footings breaking the water surface. The salvors cut the legs at the bottom of the DMC-1 and took them ashore. Measurements showed that the bottom of the stern leg footing had been 42.8 feet below the bottom of the vessel and that, although the forward legs were not identified as to port and starboard, the bottom of the footings of these legs had been 43.2 feet and 46.1 feet below the bottom of the vessel. The leg sections were not bent, and there were no dents, scrapes, or other marks that would indicate they had struck another object with force.

When the master engaged the jacking system, no motive power was applied to the vessel's propellers, and the vessel began to drift with the wind and sea. Since the loran receiver was not functioning properly, the master did not know the vessel's precise position. Thus, the depth (53 feet) that he noted on the chart may have been for a different location. The Safety Board noted that National Oceanic and Atmospheric Administration (NOAA) Chart 11300, which dpeicts the accident site, showed that the charted depth[3] in High Island Block 144 was 7-1/2 fathoms (45 feet) and that there were two charted submerged obstructions in this block. The chart showed the one obstruction had 6-3/4 fathoms (40.5 feet) of water over it and that the other obstruction had 6-1/2 fathoms (39 feet) of water over it. Since the measurements of the leg sections cut from the wreck of the DMC-1 after the accident established that all of the legs extended more than 40 feet below the vessel, it is possible that the legs struck one of the submerged objects as the vessel drifted over it, causing the vessel to capsize. However, because the leg sections cut from the wreck were not bent and did not show any evidence of scrapes or other marks, the Safety Board concludes that the legs did not collide with another object. One of the leg sections cut from the wreck was more than 45 feet below the bottom of the vessel Since the depth of the water in High Island Block 144 was about 45 feet, it is probable that this leg grounded on the sea floor as the vessel drifted at 2 to 3 knots, thereby tripping the vessel and causing it to capsize. If the vessel could have been held stationary in relation to the sea bottom during the leg jacking operation, the vessel would not have been tripped. Under normal conditions, the master could have used one of the main engines to hold the vessel stationary while he used the other main engine to operate the leg jacking machinery. However, in this case, the master had the use of only one main engine, which allowed the vessel to drift over the sea bottom while the legs were being lowered. Had the anchor been fitted with a cable, the master could have deployed the anchor to hold the vessel stationary while repairing the starboard main engine, and there would have been no reason to lower the legs. The lack of anchoring capability limited the options available to the master when the engine problem developed and may have influenced his decision to attempt to jack the vessel out of the water. The Safety Board, therefore, concludes that the inability to anchor the vessel contributed to the cause of this accident. Companies that operate lift boats should recognize that the need to anchor may arise at any time, and companies should not allow their vessels to proceed to sea without the capability to anchor.

---

[3] *At mean low water.*

Although the vessel was outfitted with the usual navigation equipment necessary for safe operation, much of that equipment was not operating properly at the time of the accident. Navigation equipment deficiencies had no causal effect upon the capsizing of the vessel; however, under other circumstances, properly operating navigation equipment could have been vital to the safety of the vessel. The Safety Board believes that the navigation equipment deficiencies on the DMC-1 indicate a need for improved equipment maintenance procedures to ensure that vital navigation equipment is maintained in good working order.

In this accident, the vessel capsized before the master could activate the general alarm system. Even if sufficient time had been available to activate the general alarm when the vessel started to capsize, there probably was insufficient time for the two deceased welders to have escaped their sleeping quarters in the deckhouse before it filled with water. Even the cook, who was preparing breakfast in the galley when the vessel capsized, barely escaped and then only because he happened to surface in an air pocket with the other two welders when the deckhouse flooded and was able to escape through a broken porthole. The Safety Board believes that the only action the master could have taken to prevent persons from being trapped inside the deckhouse when the vessel capsized was to make sure that everyone was awake and outside the deckhouse before starting leg jacking operations.

Leg jacking operations to lift or lower a vessel are the most dangerous procedures carried out on lift boats. During such operations, lift boats are the most vulnerable to capsizing. Before such operations may be conducted safely, the master must determine that the vessel is not overloaded, that the weight loads are evenly distributed, and that all of the elevating gear is in proper working condition. After these determinations have been made, the master must ensure that the vessel is held as stationary as possible over the proposed jacking site before he starts to lower the legs to the sea floor. Movement of the vessel over the sea bottom during leg jacking operations can result in damage to the legs and footings when they contact the bottom, and such movement can, as was probable in this case, result in the vessel's capsizing.

During its investigation of the accident, the Safety Board reviewed the operation manual for the DMC-1 which set forth the procedure the master was to follow in jacking the vessel out of the water. According to the manual, the vessel "shall be positioned over the work site using the propulsion system" before the leg jacking system is engaged. This instruction is indefinite because it does not state that the vessel must be maintained in this position until leg jacking operations are completed, nor does the instruction explicitly prohibit leg jacking operations when the vessel is moving over the bottom. Furthermore, compliance within this instruction presupposes that the master has full use of both main engines that make up the propulsion system so that he can use one main engine to hold the vessel in position while he uses the other main engine to power the leg jacking system. The instruction, therefore, implies that leg jacking operations to lift the vessel out of the water should not be conducted when the master has the use of only one main engine. The Safety Board believes that instructions to lift boat masters should be stated in a clear and precise manner so that they are easily understood and do not require interpretation. Had the master of the DMC-1 been given specific instructions not to jack the vessel out of the water when it is moving over the bottom or when he does not have full use of both main engines, he might not have attempted to do so, and this accident might have been avoided.

The master of the DMC-1 was faced with an emergency situation, although a minor one, when the radiator hose to the starboard main engine split. This is a common type of equipment failure which should have been relatively easy to correct and which should have taken a short time to complete without necessitating jacking the vessel out of the water. The master should have been able to shut down the starboard engine to close the isolation valves in the main engine cooling water system, and to continue to operate on the port main engine until the repair was completed to the starboard main engine. For some unknown reason, however, the isolation valves apparently malfunctioned, and both main engines had to be stopped. The master stated that he did not want to allow the vessel to drift while the repair work was in progress because of his vessel's proximity to shipping lanes where it might risk collision with other vessels. Because the vessel lacked the capability to anchor, the master believed that his only option for prudent action was to jack the vessel out of the water. However, since it was daylight, since there were relatvely mild wind and sea conditions, and since there apparently were no other vessels in the immediate vicinity of the DMC-1 (as evidenced by the fact that it took approximately one-half hour for the first vessel to arrive on scene after the accident), the Safety Board believes that it would have been more prudent if the master had allowed the vessel to drift while the radiator hose was being replaced. While adrift, the master should have hoisted the signal for "vessels not under command" as specified in the International Regulations for Preventing Collisions at Sea, 1972, so that any vessel approaching would know to keep clear of the drifting vessel. Once the repair was completed, the master could have taken down the "not under command" signal, restarted the engines, and resumed his voyage.

Recommendations

As a result of its investigation of this accident, the National Transportation Safety Board recommended that the lift boat company:

- Establish remedial procedures to ensure that necessary navigation and vessel control equipment, including anchors and anchor cables on company lift boats are on board and maintained in good operating condition.
- Amend operating instructions to company lift boat masters to require them to make sure that all persons on board the vessel are awake and outside the deckhouse whenever leg jacking opeations are in progress.
- Amend operating instructions to company lift boat masters to prohibit them from conducting jack-up operations when the vessel cannot be held in a stationary position relative to the sea floor until such operations are completed.

The National Transportation Safety Board determines that the probable cause of the capsizing and sinking of the DMC-1 was the master's decision to attempt to jack the vessel out of the water while the vessel was adrift or moving over the sea bottom. Contributing to the cause of this accident was the master's inability to anchor the vessel when it began to drift. Contributing to the loss of life was the master's failure to require all persons on board to be awake and outside the deckhouse prior to commencing jack-up operations. ‡

U.S. Merchant Marine Vessels

The privately owned, deep-draft fleet of the U.S. Merchant Marine totaled 579 vessels with a carrying capacity of about 23 million deadweight tons (dwt) on July 1, 1986, according to the U.S. Department of Transportation's Maritime Administration. The total comprised 468 oceangoing ships and 111 Great Lakes vessels.

Compared with July 1, 1985 totals, the number of ships in the U.S. oceangoing fleet decreased by 32 vessels, and the fleet's carrying capacity decreased by 351,341 dwt.

As of July 1, 1986, 8 merchant ships totaling 498,660 dwt were under construction or on order in U.S. shipyards. The shipbuilding orderbook then consisted of two tankers, three containerships, two incinerator ships, and one dredge. One additional vessel was undergoing conversion.

THE SHRIMPER

The vessel at dock at Coast Guard Base Terminal Island following the incident.

Scuttling Doesn't Pay

Lonnie Letz

On September 29, 1982, a distress call was received by Coast Guard Station Channel Islands Harbor (California) from the fishing vessel THE SHRIMPER. The vessel was taking on water 22 miles south of Santa Cruz Island, and the crew was preparing to abandon ship.

The station advised Operations Center Long Beach, which directed a helicopter to launch from Air Station Los Angeles. A 41-foot Coast Guard boat got underway from Station Channel Islands Harbor to assist the helicopter with the case. When the helicopter was about 10 minutes from the sinking vessel, a fire broke out aboard THE SHRIMPER.

This was turning into a real search and rescue case, and the crews of the helicopter and the 41-footer were beginning to feel the adrenalin flow. The helicopter crew plucked the skipper and the only crewman from the deck of THE SHRIMPER, even though the fishing rigging on the vessel and the ever-thickening smoke endangered the hoist operation. The helicopter remained on scene until the 41-footer arrived.

THE SHRIMPER seemed to maintain its buoyancy, and the crew of the 41-footer determined that they could possibly put the fire out and keep THE SHRIMPER afloat. By this time, the 82-foot Coast Guard cutter POINT CAMDEN had been directed to assist by towing the damaged vessel to Coast Guard Base Terminal Island. Everyone did their jobs as they had been trained to do — to save lives and property at sea.

The crew from POINT CAMDEN continued to pump the damaged vessel while towing it to Base Terminal Island.

Mr. Letz is a Special Agent assigned to the Office of Intelligence and Law Enforcement, Eleventh Coast Guard District.

When it was safe to enter the engine room of THE SHRIMPER, running water could still be heard coming into the vessel. The source of the water was easily located, coming in through a cut hose attached directly to the open sea chest valve. The sea chest valve was immediately closed by one of the damage control party members, and the vessel stopped taking on water. Further examination by the damage control party revealed that another plastic pipe, directly connected to the sea chest valve, had been cut, and a flange had been intentionally pried away from a pump housing.

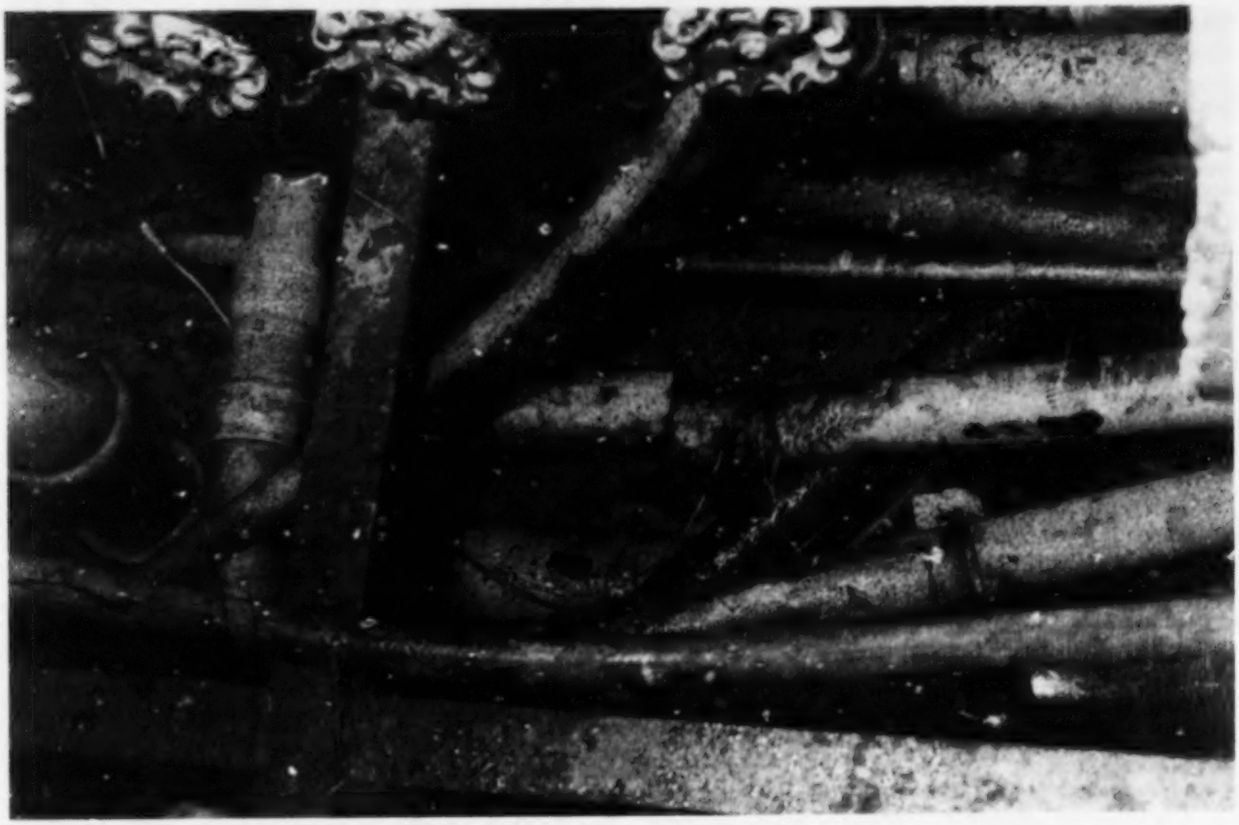
Now the focus changed from search and rescue to the possibility of a violation of Title 18 USC, Sections 2271 through 2275 — intentional destruction of a U.S. vessel.

The crew of POINT CAMDEN requested that Coast Guard intelligence and marine safety office investigators meet them at the dock. A criminal investigation began. Photographs were taken, evidence preserved, statements taken, and assistance from arson investigators was requested. Preliminary investigation revealed that THE SHRIMPER appeared to have been insured for close to $500,000. The FBI was briefed and assumed primary jurisdiction. The FBI investigation continued for more than a year.

In the summer of 1985, Assistant U.S. Attorney Gary Feess, who considered the extreme risk the Coast Guard crews put themselves in, reviewed all the facts. He felt that the Coast Guard and FBI investigation had a good chance of indicting the skipper of THE SHRIMPER.

Eight Coast Guardsmen testified at the trial. On February 12, 1986, the skipper of THE SHRIMPER was convicted in federal court of both attempted destruction of a vessel and setting fire and cutting the plumbing with the intent to damage a vessel.

On March 31, the skipper was sentenced to 3 years in prison. He was also placed on 3 years' probation, which he will serve when released from prison. ⚓



A cut pipe near the sea chest.

Overcurrent Devices

Electrical equipment and principles are often the source of much confusion. This article looks at one type of electrical device and defines it in terms that everyone can understand.

Clayton O. Crapps

Overcurrent devices are an essential part of a vessel's electrical system and are provided for two reasons: to protect electrical equipment from damage and to protect people from injury. The proper use of overcurrent devices can be a major factor in electrical safety and in preventing personal injury and loss of property.

Electrical Faults

Overcurrent devices provide protection from three types of failures, or faults, as they are known in electrical terminology: overloads, short circuits, and ground faults.

An overload is a condition where equipment is operated in excess of its full load rating or a conductor is operated in excess of its rated current-carrying ability (ampacity). If this condition persists for a sufficient length of time, dangerous overheating or damage could occur to equipment.

A short circuit is a condition where a relatively low resistance path exists, either accidentally or intentionally, between two different electrical points. This condition can be extremely hazardous and must be corrected immediately.

A ground fault is an unintentional path of relatively low resistance between the "hot," or line side, and ground. This condition can cause current to flow through the equipment casing and through the hull of metal vessels. This can damage equipment and be especially dangerous to personnel.

Types of Overcurrent Devices

The most commonly used overcurrent devices are fuses and circuit breakers, of which there are different types.

One type of circuit breaker is known as a thermal trip breaker. Since current flowing through a conductor generates heat, this type of breaker works similarly to a thermostat. A bimetallic strip is installed in such a way that the flow of current is through the strip. The resistance of this strip is carefully controlled so that a specific amount of current generates the heat required for it to move. This movement will cause the strip to connect with a contact which then causes the breaker to trip. The strip will then cool down, and the breaker can be reset. These breakers can be adjustable. The strip is designed so that a screw can either control the distance between it and the contacts, or it can control spring tension on a spring that holds the strip in place. Another important feature in a thermal trip breaker is the time it takes for the strip to heat up to cause movement. The higher the current, the faster heat builds up, and the quicker the breaker trips. Similarly, if the current is only slightly above the setting, it takes much longer for heat to build up and the breaker to trip. This time delay is necessary in applications involving motors, where the starting current is much higher than the running current. The

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Mr. Crapps is an Electrical Engineer in the Engineering Branch, Marine Technical and Hazardous Materials Division, Office of Marine Safety, Security, and Environmental Protection, U.S. Coast Guard.

technical terminology for this type of circuit breaker is "inverse time trip," and the values for time and current can be obtained from the circuit breaker's manufacturer.

A second type of circuit breaker is the magnetic trip variety. This type of trip consists of three major components: a spring-loaded set of contacts, a pivot-mounted latch that is made of a material that is attracted by magnets, and an electromagnet made of a few turns of heavy wire through which all current passes. The spring holds the contacts in place and determines the amount of force required to move the contacts. When the circuit is energized, current passes through the coils of the electromagnet, creating a magnetic field that attempts to move the latch. The strength of this field depends on the amount of current in the circuit. The advantage of this type of trip is that it is "instantaneous." It will immediately remove the high currents that result from a short circuit.

Fuses are thermal devices. A fuse contains a strip of metal that will melt when the temperature rises to a certain point. There are many different types of fuses serving different purposes. Some of these are current-limiting fuses, dual-element fuses, time-delay fuses, quick-acting fuses, etc. The majority of fuses that will be used are "one-time" fuses, which are designed to interrupt an electrical overload once and then be replaced.

Overcurrent Device Ratings

Overcurrent devices have three important ratings. The first is voltage. An overcurrent device must always have a voltage rating equal to or greater than the voltage of the circuit or equipment it is protecting. The other two ratings address current. These ratings are the continuous rating and the short circuit rating. The continuous rating is the current which the device will carry indefinitely without tripping. The short circuit rating is the value of short circuit current the device will safely interrupt. For example, if the continuous rating of a standard, molded case circuit breaker is 15 amperes, it will not trip until the current exceeds 15 amperes. But, at any value above 15 amperes, the breaker will trip in some specified time. The higher above 15 amperes the current is, the sooner the breaker will trip. (This is the inverse time relationship discussed earlier.) The short circuit rating of this same breaker may be 10,000 amperes. This means that the breaker will open, without exploding, on short circuit currents up to 10,000 amperes. When installing new overcurrent devices, it is important to check that both ratings match the existing installation when replacing overcurrent devices.

Marine Devices

Many people question the difference between a marine fuse or circuit breaker and the standard household item. There really aren't any major differences, but there are a couple of things to be aware of. The first concerns the use of noncorrosive materials. Some manufacturers provide circuit breakers designed for use in an environment similar to that found in marine applications. One way of checking is to consult the manufacturer's catalog. Additionally, almost all molded case breakers sold in the United States meet Underwriters Laboratory Standard 489. There are provisions in UL 489 to test breakers specifically for marine use.

The second concern is temperature. A standard, 15 ampere circuit breaker is designed so that any current greater than 15 amperes produces the heat necessary to move the bimetallic strip. In order to design and test circuit breakers, a standard ambient temperature must be used, usually 25°C (77°F). Therefore, if circuit breakers are used in higher ambient temperatures, they will not carry the rated current without tripping. When using overcurrent devices in areas of high ambient temperature, this must be taken into consideration.

Overcurrent devices must be used correctly for them to properly protect people and equipment. The simplest way to ensure safety is to follow various electrical installation codes and practices, many of which are required by law. For shore use in the United States, the National Electrical Code is most frequently referenced. For marine applications, information can be found in Coast Guard regulations, 46 CFR Part 111, and IEEE Standard 45. ⚓

Permission for Carriage Without Subsidy

The Maritime Subsidy Board (U.S. Department of Transportation, Maritime Administration) has given American Shipping, Inc., permission to use the BEAVER STATE to carry a World Food Program parcel without subsidy at or below the fair and reasonable freight rate for U.S.-flag commercial vessels.

The 75,000-ton parcel consists of bulk wheat to be carried from the U.S. West Coast to Pakistan. ⚓

"Choke Lines" Under High Pressure Sometimes Kill

Thomas J. Pettin

Working around high-pressure systems can be hazardous. On the morning of April 20, 1985, an unfortunate accident occurred to a mud engineer disengaging a connector on a "choke line" aboard the drilling vessel GLOMAR ATLANTIC. The male end of the quick connect test fitting (under 9,000 pounds of pressure) ruptured, and flying debris struck the engineer's skull, killing him instantly.

On the morning of the tragedy, personnel were conducting pressure tests of the choke and kill lines as part of the procedure of installing the marine riser. The marine riser is a sectional assembly that provides a return-flow path between the well bore and the drill vessel and to guide the drill string or casing to the Blow Out Preventor (BOP) stack on the ocean floor. The choke and kill lines are integral parts of the marine riser sections. Choke and kill lines are used in controlling abnormal well bore pressure during drilling operations, thereby helping to minimize blowouts.

Casualty Analysis

On the day of this casualty, a Halliburton pump was used to pump water under high pressure to the choke and kill lines to determine if the assembled lines were properly sealed. The test fitting consisted of a series of reducers, and the male end of a quick connect coupling was attached to a length of small-diameter, high-pressure hose that ran to the Halliburton unit. After the test to 9,000 psi, the mud engineer released the pressure from the test set-up at the Halliburton pump. This action was expected to release the pressure from the entire system, subject to the test pressure. The female connector was subsequently disconnected from the test fitting without incident. The mud engineer started to remove the male quick connect fitting, and it exploded. As a result, the mud engineer received fatal skull injuries. Subsequent investigation revealed that the check valve was missing from the female end of the quick connect coupling. Normally, this type of coupling, when made up, allows bidirectional flow, but with the valve missing from the female end, the coupling would only allow one-way flow. There was no gauge on the test fitting nor was there a valve by which to drain off any pressure before removing the test fitting.

This casualty could have been avoided by testing the choke and kill line with a straight line system. A straight line system doesn't use check valves. The entire line from the pump to the BOP stack is open and free of check valves to inhibit the flow of the test medium. A pressure gauge on the test pump can then be used to monitor line pressure on the entire choke or kill line. Pressure on the entire system can then be released at any time by a valve located on the test pump.

If it is necessary to use self-closing, quick connect couplings on high-pressure lines, a means of releasing residual pressures on either side of the coupling should be provided.

It has been noted that individuals working around these high-pressure systems day in and day out can become complacent about the potential hazards associated with them. Persons working around such high-pressure systems cannot afford to relax their guard at any time. A quick look at the accident data collected on the offshore industry reveals that over 73 percent of the deaths and associated injuries were attributed to human error. The U.S. Coast Guard has been legislated responsibility for workplace safety offshore and has developed regulations and safety equipment requirements as a means of improving safety offshore.

However, safety cannot be mandated purely through regulation. The offshore indus-

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Mr. Pettin is a Program Analyst with the Marine Safety Evaluation Branch, Marine Investigation Division, Office of Marine Safety, Security and Environmental Protection.

try deals with volatile fluids, heavy moving equipment, and high-pressure systems in a sometimes hostile ocean environment. Companies must properly educate workers not only to work in a safe manner, but also to recognize unsafe and hazardous situations. Supervisors must actively enforce their company's safety programs. Finally, and most importantly, safety must be forever foremost in each worker's mind.

New Publications

The Complete Book of Anchoring and Mooring

The Complete Book addresses anchoring systems, techniques, and permanent moorings for boats from 12' to 80' in length. It covers monohulls, multihulls, light displacement sailboats, cruisers, sportfishers, passagemakers, and workboats. In short, it is for **all** recreational and working boats in this size range.

The book deals not only with anchor behavior but also with the rode assembly, riding stoppers, and the human factors. What formerly was thought of as strength through size (heavy anchors and large rodes) has been refined to decrease weight, lighten loads on the boat, and reduce difficulty in handling.

Utilizing a systems approach with respect to equipment and techniques and analytical methods for loads, author Earl R. Hinz makes a number of contributions to the state of the art. Among them are bow anchor roller design, elastic anchoring techniques, tandem anchor systems design, and designs for permanent moorings. Most of these designs and techniques are clearly illustrated in the schematic drawings by Richard R. Rhodes. ***The Complete Book of Anchoring and Mooring****, by Earl R. Hinz. Available from Cornell Maritime Press, P.O. Box 456, Centreville, MD 21617. Price: $22.50.*

BOOZE & YOU

Twelve ounces of 4 percent beer, four ounces of 12 percent wine and 1.2 ounces of 80 proof spirits contain identical amounts of alcohol.

– Alcohol in America: Taking Action to Prevent Abuse

Letters to the Editor

We received the following letter from a ***Proceedings*** *reader in response to "Drugs and the Merchant Mariner," published in the August 1986 issue (page 171). Do you share this reader's viewpoint, or is there another opinion you'd like to express? Please send your thoughts to Editor,* ***Proceedings*** *Magazine, U.S. Coast Guard (G-CMC), 2100 Second St., SW, Washington, DC 20593. We will publish your letter anonymously if you request it.*

Dear Editor:

Having read the article "Drugs and the Merchant Mariner," I was impelled to reply on numerous points raised and on others left unsaid.

While drug abuse (alcohol included) has permeated all levels of society and has no doubt been the cause of numerous on-job accidents, does this alone warrant widespread drug testing? From what I understand about urinalysis, it is not 100% accurate, nor does it show up **all** the drugs that can be abused. Cocaine is said to dissipate in 3-5 days. LSD is untraceable. Only marijuana is retained in the fat cells for any long length of time. And the fact one shows positive does not mean one is under the influence at the time of the test, many weeks later. Some tests for marijuana will show positive even if a person was just in a room where it was smoked even if he himself did not smoke it. Now as a Merchant Marine, I realize that we are subject to Federal laws, but let's try and look to see if the crime (smoking marijuana away from work, on leave) justifies the loss of a seaman's livelihood.

Several states (California, Ohio, and Oregon, etc.) have decriminalized possession laws for marijuana. Alaska has legalized its use. So a seaman who lives in Alaska and smokes marijuana while home on leave is breaking no law in Alaska. But say, two weeks later, he gets on a ship and has to submit to mandatory urinalysis and shows positive. Then should he be fined? Should he be sent to a drug rehabilitation center? Is this nit-picking what America's all about? Who's going to foot the bill for the "safety act" welfare system after people have lost their jobs?

Should the Coast Guard subject the Merchant Marines to mandatory, possibly inaccurate urinalysis, placing a man's livelihood on the line? Or should a rehabilitation program solely for seamen be instituted much like the centers for alcoholism? Thousands of people's livelihoods and families will be affected.

During the alcohol prohibition of the 1920s (which firmly entrenched large gangster syndicates through the amassed "bootlegging" fortunes), how many millions were spent to stop the flow of illegal liquor into this country? To what avail? The amendment was repealed, and now while we are faced with a drug "witch hunt" (shades of Joe McCarthy), the TV media commercials tell us "we can have it all" with a shot and a beer.

Am I any safer working for a skipper who is hung over and barely functioning (though not legally drunk) than for one who smoked marijuana the weekend before while off work? Will the Coast Guard also test for alcohol dependency? How will this be determined? I've worked a lot of ships with a lot of drunks and I never saw any get fired. Is the functioning alcoholic somehow left out of this dragnet because alcohol is legal? And alcoholism is recognized as a disease, not a crime. Quite a bit of contradiction here.

I think the way the Coast Guard now operates is fine in respect to drug testing. A person is innocent until proven guilty. Due process still prevails. Surely when a seaman on the job acts intoxicated or is in possession of drugs or alcohol, he should be removed from the vessel. Testing should remain the final step after the seaman has shown probable cause through poor job performance, aberrant behavior, or drug possession on the job. How we perform on the job should be the criteria by which we are judged, not urinalysis.

Sincerely,

(Name withheld)

NOTE: NO PROCEEDINGS MAGAZINE IN DECEMBER

The November and December 1986 issues of the ***Proceedings*** *are being printed this month as one magazine. Your editor will be using the extra time to learn how to operate a desk-top publishing system. This system will enable us to upgrade the magazine's appearance and, we hope, to make it more readable for you.*

We are planning to have this new system in use for our next issue. Keep an eye open for the "new and improved" version of ***Proceedings*** *in January 1987.*

Marine Safety Council Membership

CAPT James H. Parent

Captain James H. Parent assumed the duties of Executive Secretary of the Marine Safety Council and Executive Director of the Towing Safety Advisory Committee on September 2, 1986.

CAPT Parent, a native of Greenville, Maine, is a graduate of the U.S. Coast Guard Academy, New London, Connecticut, where he earned his Bachelor of Science degree in 1960. His first assignment was aboard the cutter BARATARIA, homeported in Portland, Maine, where he served in deck and engineering positions. In 1963, he became Industrial Manager at Coast Guard Base San Juan, Puerto Rico. Following a tour of duty as engineering officer aboard the cutter CHEROKEE in Norfolk, Virginia, he was assigned to marine safety duties in New Orleans, Louisiana, and Norfolk, Virginia, from 1968 to 1976. In 1976, he was assigned to Coast Guard Headquarters in the Office of Merchant Marine Safety. CAPT Parent asumed command of Marine Safety Office San Juan, Puerto Rico, in 1980 and returned to Coast Guard Headquarters in 1982 as Chief, Personnel Services Division, in the Office of Personnel. Prior to assuming the duties of Executive Secretary, he served as Deputy Chief, Office of Marine Environment and Systems (G-W).

CAPT Parent's decorations include the Meritorious Service Medal and two Coast Guard Commendation Medals.

He is married to the former Catherine E. McPhee of Portland, Maine. They have two children: Maria, a student at Seneca Valley High School, Germantown, Maryland, and Michael, a student at St. Francis College, Loretto, Pennsylvania.

Chemical of the Month

Richard W. Sanders

Butyl Acrylate (monomer)

Butyl acrylate belongs to a family of compounds known as acrylics. These compounds are used extensively in manufacturing a variety of products, including finishes, paints, textiles, and paper. Of this family, butyl acrylate is second in production only to ethyl acrylate.

Butyl acrylate is a colorless, flammable liquid. It boils at 148.8°C (299.8°F) and is odorless. Butyl acrylate is an ester (a class of organic copounds) and contains carbon, hydrogen, and oxygen. Structurally, there is a three-carbon and four-carbon chain, connected by an oxygen molecule. There is also an oxygen bonded to the inner carbon of the three-carbon chain. When reacted, the chemical forms long carbon chains between the different molecules. These polymers are mixed with other materials to form the desired characteristics of a product. For example, the polymers give acrylic paint its stretchiness, hardness, gloss, and resistance to fading. Butyl acrylate polymers are used in coatings, especially for vehicle paint. These materials impart clarity, toughness, ultraviolet protection, stability, and chemical inertness. Primers and topcoats containing butyl acrylate are very durable. Similarly, acrylate polymers applied to textiles give fabrics a desired type of feel: ranging from soft to crisp, or rubbery to leathery. The polymers are used in place of natural and artificial rubbers, as paper saturants, and on pigmented coatings. Other uses include leather finishing and acting as modifiers for cement, where they impart strength and improve adhesion to substrates.

Butyl acrylate is polymerized through a method known as transesterification. Both heat and a catalyst are employed. There are two important methods of production for this chemical. The Reppe process employs a nickel catalyst and uses carbon monoxide, acetylene, water, alcohol, and acid. A newer method, propylene oxidation, is carried out with a catalyst at high temperatures in the presence of steam.

Butyl acrylate is corrosive to the eyes and poses a flammability hazard. Threat of fire or explosion is most acute during the production of acrylic polymers (linking of the molecules into long chains.) Environmental legislation governing air quality has resulted in completely "closed kettle" processes for polymerization reactions.

In contrast, butyl acrylate polymers are considered to be nontoxic. The FDA allows products made from butyl acrylate to be used in the packaging and handling of food.

The reported exposure limit in the workplace to butyl acrylate is 10 ppm (parts per million). This value corresponds to the concentration of the chemical over an 8-hour shift. Work involving butyl acrylate should proceed in areas of adequate ventilation, and employees should avoid contact with the liquid. If the chemical is spilled on the skin, the exposed area should be washed thoroughly with soap and water. If butyl acrylate gets into the eyes, the the victim should rinse the eyes with water for 10 minutes and seek medical aid. In the event of a spill, an all-purpose canister mask should be worn, and ignition sources should be secured. The National Response Center should be called to obtain further information and assistance with the situation.

Butyl acrylate is shipped in a variety of containers. One- to five-gallon cans are used for small quantities. Fifty-five gallon metal drums are also used. For large amounts, tank trucks, tank cars, and tank barges are employed. In normal practice, inhibitors are used to stabilize the chemical during shipment or storage. Inhibitors reduce the chance of an unwanted reaction or explosion.

The U.S. Coast Guard lists butyl acrylate as a Grade D combustible liquid. Bulk regulations governing it can be found in Title 46, Subchapter O, of the Code of Federal Regulations. The International Maritime Organization

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Richard W. Sanders was a Second-Class Cadet at the U.S. Coast Guard Academy at the time this article was written. It was written under the direction of LCDR J.J. Kichner for a class on hazardous materials transportation.

includes it as a Class 3.3 chemical in Chapter 6 of its Chemical Code. The U.S. Environmental Protection Agency regulates butyl acrylate under Title 40, Subchapter D. The Department of Transportation regulations are found in Subchapter C of Title 49 of the CFR. ‡

Chemical name:	n-Butyl Acrylate
Formula:	$CH_2CHCOOC_4H_9$
Synonyms:	acrylic acid n-butyl ester
Physical Properties:	
boiling point:	148.8°C (299.8°F)
freezing point:	-64°C (-83°F)
vapor pressure:	
20°C (68°F)	3.2 mmHg
46°C (115°F)	0.4 psia
Threshold Limit Values (TLV)	
time-weighted average:	10 ppm
Flammability Limits in Air	
lower flammability limit:	1.5% by vol.
upper flammability limit:	9.9% by vol.
Combustion Properties	
flash point:	39°C (102°F)
autoignition temperature:	297°C (567°F)
Densities	
liquid (water=1):	0.90
vapor (air=1):	4.4
U.N. Number:	2348
CHRIS Code:	BTC
Cargo compatibility group:	14 (Acrylates)

FIRE CONTROL
IN CASE OF FIRE TURN UPSIDE DOWN

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. An automatically fired auxiliary boiler is required by Coast Guard regulations to be shut down by

A. low boiler pressure
B. low water level
C. wide flame cone angle
D. high fuel oil pressure

Reference: 46 CFR 63.05-40(B); 46 CFR 63.10-40(A)

2. On a diesel engine equipped with a hydraulic speed-control governor, hunting can be corrected by adjusting the

A. accumulator spring tension
B. balance piston
C. compensating needle valve
D. proportioner piston

Reference: Kates and Luck, Diesel and High Compression Gas Engines; Maleev, Diesel Engine Operation and Maintenance

3. The amount of cushioning effect within a hydraulic cylinder is determined by the

A. position of the directional port in the cushion cavity
B. adjustment of the cushion cavity check valve

C. design shape of the cylinder ends
D. position of the cushion adjustment needle valve

Reference: McNickle, Simplified Hydraulics

4. On a cargo vessel, Coast Guard regulations permit which of the following to be used for emergency bilge suction?

A. Main fire pump
B. Fuel oil service pump
C. Main bilge pump
D. Fuel oil transfer pump

Reference: 46 CFR 56.50-50(F)

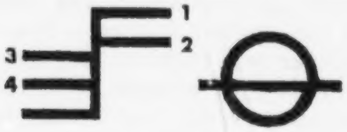
5. The function of a step-down potential transformer is to reduce load

A. voltage and current
B. voltage and increase line current
C. current and increase line voltage
D. power

Reference: Mileaf, Electricity One-Seven

DECK

1. Which loadline is indicated by the number 4?



A. WNA
B. W
C. S
D. F

Reference: Ladage, Modern Ships

2. In order to check your vessel's stability, a weight of 40 tons is lifted with the jumbo boom, the boom head being 50 feet from the ship's centerline. The clinometer is then carefully read and shows a list of 5 degrees. The vessel's displacement is 8,000 tons including the suspended weight. What is the metacentric height of the vessel at this time?

A. 2.74 feet GM
B. 2.80 feet GM
C. 2.86 feet GM
D. 2.93 feet GM

Reference: Ladage, Stability and Trim for the Ship's Officer

3. On a worldwide tramp steamer, which of the four navigational systems mentioned would be most advantageous?

A. Decca
B. Satellite
C. Loran-C
D. Consol

Reference: Bowditch, American Practical Navigator

4. You are in charge of a power-driven vessel navigating at night. You sight the red sidelight of another vessel on your port bow. Its after masthead light is to the right of the forward masthead light. You should

A. hold course and speed.
B. alter course to port.
C. stop engines.
D. sound the danger signal.

Reference: COMDTINST M16672.2A

5. River charts (maps) are prepared and distributed by the

A. Maritime Administration
B. U.S. Army Corps of Engineers
C. U.S. Coast Guard
D. Regional Waterways Council

Reference: Mississippi River Maps

ANSWERS

ENGINEER
1-B;2-C;3-D;4-A;5-B
DECK
1-C;2-C;3-B;4-A;5-B

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417. ⚓

Saari Is New MARAD Official

Maritime Administrator John Gaughan has announced the appointment of James E. Saari as Secretary of the Maritime Administration and the Maritime Subsidy Board.

Saari was most recently a consultant on maritime matters to the law firm of Kominers, Fort, Schlefer & Boyer. He previously served as General Counsel at WFI Industries, Inc., a marine shipbuilding and transportation company, and as Assistant Chief Counsel for MARAD.

Saari earned a B.A. degree from the University of Miami and a J.D. from Cleveland-Marshall Law School. He is a member of the Ohio Bar. ⚓

Keynotes

Notice

CGD 86-042, Vessel Certificates and Exemptions Under the International Regulations for Preventing Collisions at Sea (72 COLREGS) (September 8)

This notice lists commercial vessels granted Certificates of Alternative Compliance between May 20, 1982, and October 22, 1985. This notice was effective as of September 8, 1986.

Notices of Proposed Rulemaking

CGD 85-092, Puget Sound Vessel Traffic Service (September 12)

The Coast Guard proposes to amend the regulations for the Puget Sound Vessel Traffic Service (PSVTS). This proposal is intended to update the reporting requirements to reflect the Vessel Traffic Center's increased radar coverage capabilities, clarify the wording throughout the regulations, and reorganize and reword the regulations to make them compatible with the proposed Cooperative Vessel Traffic Management System regulations which will apply to waters adjacent to those covered by the PSVTS regulations.

CGD 80-101, Pollution Rules for Ships Carrying Hazardous Liquids (September 26)

The Coast Guard is implementing Annex II of the 1978 Protocol to the International Convention for the Prevention of Pollution from Ships, 1973 [MARPOL 73/78] by proposing design and operating requirements for all ships that are oceangoing United States ships or are foreign ships and are trading in United States waters, and that carry bulk cargo of noxious liquid substances. Comments must be received on or before November 10, 1986.

CGD 85-010, Control of Residues and Mixtures Containing Oil or Noxious Liquid Substances (September 26)

The Coast Guard is proposing to amend the pollution regulations. These amendments are necessary in order to implement the Annex II port and terminal backpressure requirements and reception facility requirements of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto [MARPOL 73/78]. These amendments would reduce the amount of residues remaining in ships' cargo tanks, limit the amount of noxious liquid substances (NLS) discharged into the sea, and ensure that ships would suffer no undue delay while waiting to discharge this material to a reception facility. Comments must be received on or before November 10, 1986.

Affirmation of Interim Final Rule

CGD 78-035, Reception Facility Requirements for Waste Materials Retained On Board (September 18)

This document affirms without change the interim final rule published on September 9, 1985, which put into effect the requirements of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol relating thereto [MARPOL 73/78]. This rule was effective as of September 18, 1986.

Final Rules

CGD 80-159, Damage Stability and Flooding Protection for Great Lakes Vessels (September 18)

The Coast Guard is amending the stability requirements for bulk dry cargo vessels operating on the Great Lakes of North America to impose a one-compartment damage stability standard for Great Lakes bulk carriers. These standards are intended to reduce vessel loss or at least slow sinking enough to allow the crew to safely abandon ship. Effective November 17, 1986.

CGD 86-037, Documentation of Vessels (September 19)

The Coast Guard is revising the regulations concerning the documentation of vessels forfeited for a breach of the laws of the United States. These changes will improve the marketability of vessels forfeited and allow vessel purchasers to realize the full benefits of a vessel with a clear title and domestic trade entitlements. Effective September 19, 1986.

Requests for copies of NPRMs should be sent to Commandant (G-CMC), U.S. Coast Guard, 2100 Second St., SW, Washington, DC 20593; telephone (202) 267-1477. ⚓

US Department
of Transportation

United States
Coast Guard

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